



MITUTOYO[®]
MEASURING INSTRUMENTS

CATALOG NO.

3000

THE WORLD'S LARGEST MANUFACTURER OF PRECISION TOOLS

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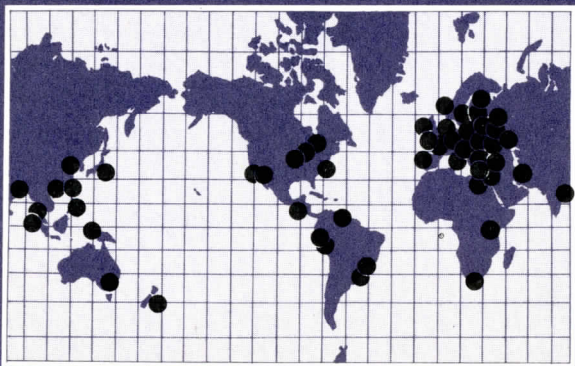


45 YEARS OF PRECISION AND DEDICATION

45 years ago, MITUTOYO made its first micrometer—the first ever made in Japan. Today, MITUTOYO is the world's largest manufacturer of micrometers and other precision measuring instruments, and is recognized and respected, the world over, for the accuracy and quality of its products.

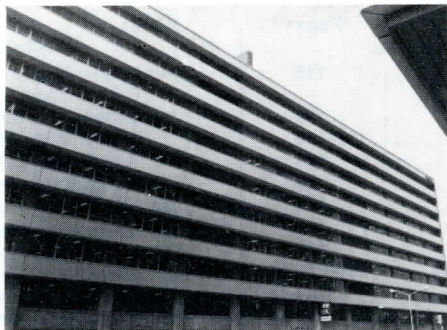
The map, below, testifies to the growth of MITUTOYO and the acceptance it has achieved in all the industrialized nations.

MITUTOYO is proud of the new measuring instruments it has introduced to help the metalworking industries cope with the ever-changing needs in quality control. And, it is MITUTOYO's endeavor to pursue precision and develop new gaging concepts, as well as, perfect current measuring tools.

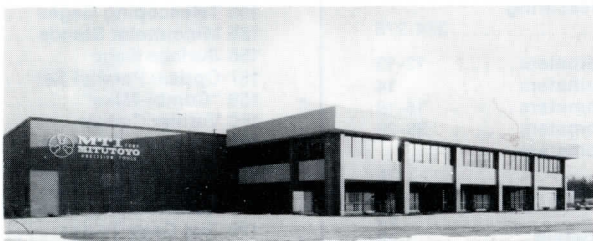




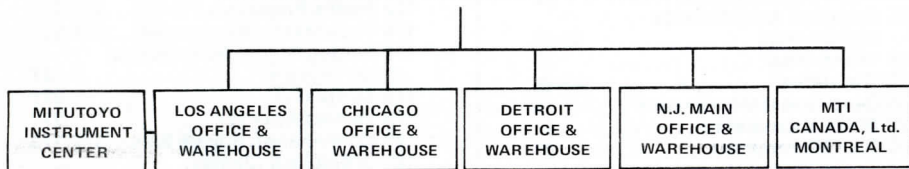
MITUTOYO®



MITUTOYO Headquarters, Tokyo, Japan



MTI CORPORATION Headquarters, Paramus, New Jersey



In the United States, MITUTOYO Precision Measuring Instruments are marketed by MTI Corporation, and in Canada, by MTI Canada Ltd.

Locally, MITUTOYO Precision Measuring Instruments are sold through leading industrial distributors, who provide technical expertise to their prospects and customers, and maintain stocks of instruments to satisfy immediate needs. To support the sales efforts of these distributors, MTI provides field-sales assistance, and complete line demonstration facilities and repair-service centers in each Branch Office.

If you need further information or demonstration on MITUTOYO products, contact your local industrial distributor. For additional technical assistance, MTI Field Engineers will be pleased to visit your plant.

We look forward to the pleasure of serving you soon.



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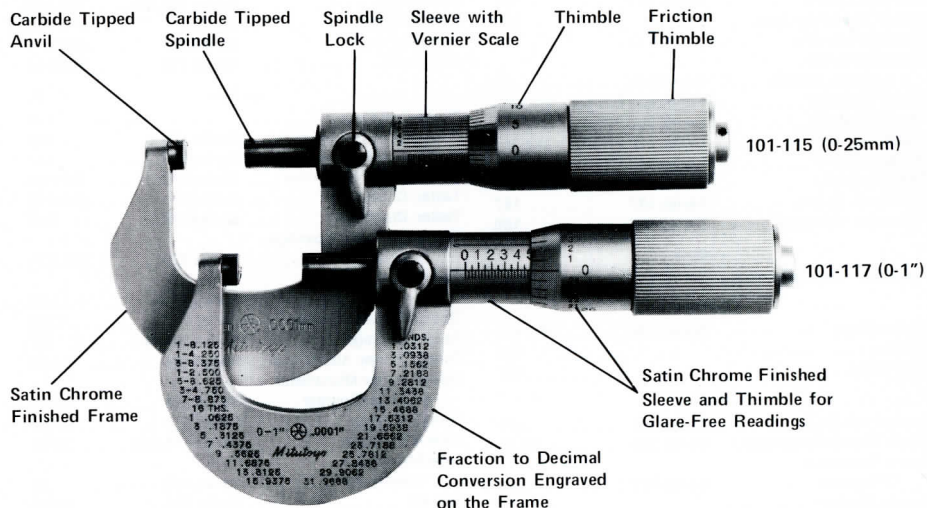
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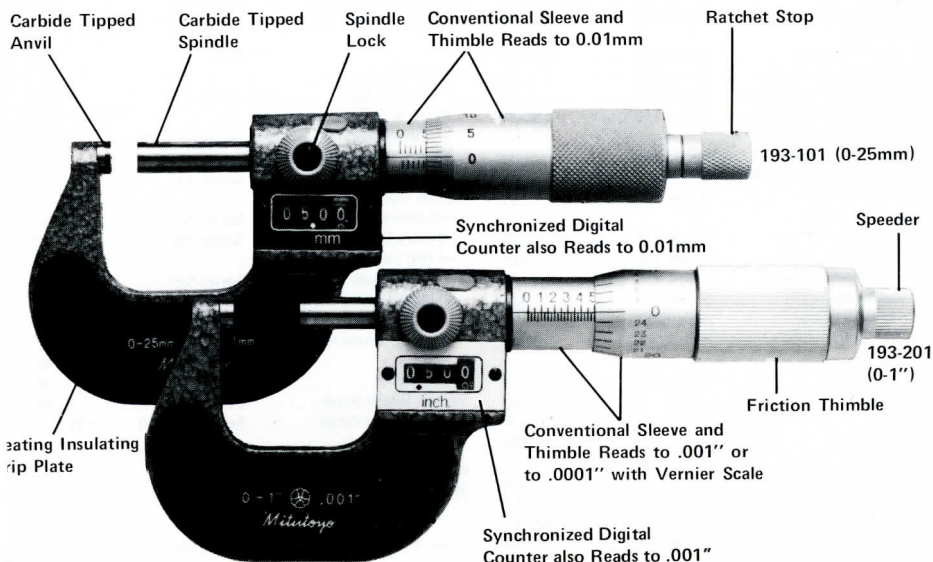
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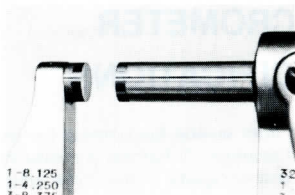
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MITUTOYO OUTSIDE MICROMETERS STANDARD FEATURES

CARBIDE MEASURING FACES

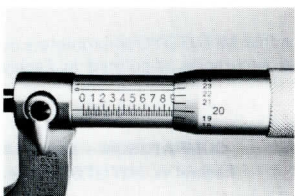


1. All standard MITUTOYO Outside Micrometers, and, many special purpose micrometers, have carbide measuring-faces which assure high accuracy over longer tool life.

Flatness Comparison

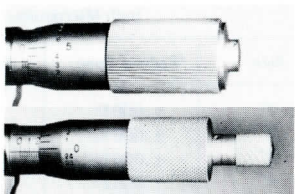
Federal Specification	MITUTOYO Specification
.00005"	.000024"

SATIN-CHROME FINISHED SLEEVE AND THIMBLE



2. MITUTOYO's satin-chrome-finished sleeves and thimbles are designed to greater diameters, than used in some other micrometers, so as to obtain larger circumferences on which to engrave widely-spaced graduations. This results in much easier reading and less chance of reading error.

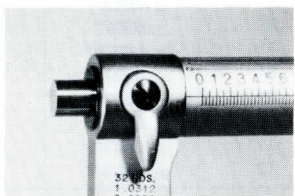
FRICTION THIMBLE or RATCHET STOP



3. All MITUTOYO Outside Micrometers have either ratchet stop or friction thimble. Specifications of the measuring pressures are as follows:

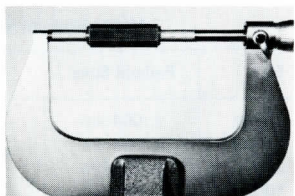
Range	Ratchet	Friction
0-4"	400 - 600gm	800 - 1000gm
4-12"	500 - 700gm	800 - 1000gm
12-40"	700 - 1000gm	—

SPINDLE LOCK

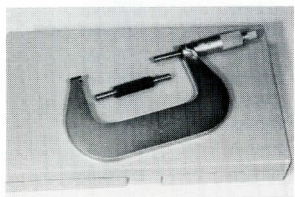


4. All MITUTOYO Outside Micrometers, except non-rotating-spindle types, have a spindle lock to hold measured dimensions. The lock is, also, useful for checking fits and clearances.

STANDARD BAR



CARRYING CASE



5. A standard bar is furnished with each MITUTOYO Micrometer, up to the 12" or 300mm models. All standard bars are protected, by a heat-insulating grip-cover, to prevent thermal expansion. Both ends of MITUTOYO Standard Bars are flat and parallel within a close tolerance.

6. Each MITUTOYO Micrometer, and, most other MITUTOYO Measuring Tools, is supplied with a fitted carrying case to protect the fine instrument. The case is not extra, and, it is furnished automatically with the tool you order.



MITUTOYO MICROMETER ACCURACY SPECIFICATIONS

The accuracy of a micrometer is derived from several fundamental factors. The most significant factors are: 1) thread accuracy, 2) flatness of measuring faces, 3) parallelism between the faces and 4) rigidity of the frame which holds anvil and spindle.

The following comparisons clearly indicate that MITUTOYO Micrometers not only meet, but most often exceed those accuracies stipulated in Federal Specifications.

COMPARISON

Federal vs. MITUTOYO Specifications

Flatness (anvil or spindle tip)

Size	Federal Spec.	MITUTOYO Spec.
1"	.00005"	.000024"
2"	.00005"	.000024"
3"	.00005"	.000024"
4"	.00008"	.000024"
5"	.00008"	.000024"
6"	.00008"	.000024"
7"	.00008"	.000024"
8"	.00008"	.000024"
9"	.00008"	.000024"
10"	.0001"	.000024"
11"	.0001"	.000024"
12"	.0001"	.000024"

Parallelism (Between anvil and spindle)

Size	Federal Spec.	MITUTOYO Spec.
1"	.00005"	.00005"
2"	.00010"	.00008"
3"	.00015"	.00008"
4"	.0002"	.00012"
5"	.0002"	.00012"
6"	.0002"	.00012"
7"	.00025"	.00012"
8"	.00025"	.00016"
9"	.00025"	.00016"
10"	.0003"	.00016"
11"	.0003"	.00016"
12"	.0003"	.00020"

COMPARISON — Overall Accuracy

Federal vs. MITUTOYO Specifications

Inch Micrometers

Size	Federal Spec.	MITUTOYO Spec.
1"	± .0001"	± .0001"
2"	± .00015"	± .00015"
3"	± .00015"	± .00015"
4"	± .0002"	± .0002"
5"	± .0002"	± .0002"
6"	± .0002"	± .0002"
7"	± .00025"	± .00025"
8"	± .00025"	± .00025"
9"	± .00025"	± .00025"
10"	± .0003"	± .0003"
11"	± .0003"	± .0003"
12"	± .0003"	± .0003"

Metric Micrometers

Size	Federal Spec.	MITUTOYO Spec.
25mm	± .004mm	± .002mm
50mm	± .004mm	± .002mm
75mm	± .004mm	± .002mm
100mm	± .005mm	± .003mm
125mm	± .005mm	± .003mm
150mm	± .005mm	± .003mm
175mm	± .006mm	± .004mm
200mm	± .006mm	± .004mm
225mm	± .006mm	± .004mm
250mm	± .0075mm	± .005mm
275mm	± .0075mm	± .005mm
300mm	± .0075mm	± .005mm



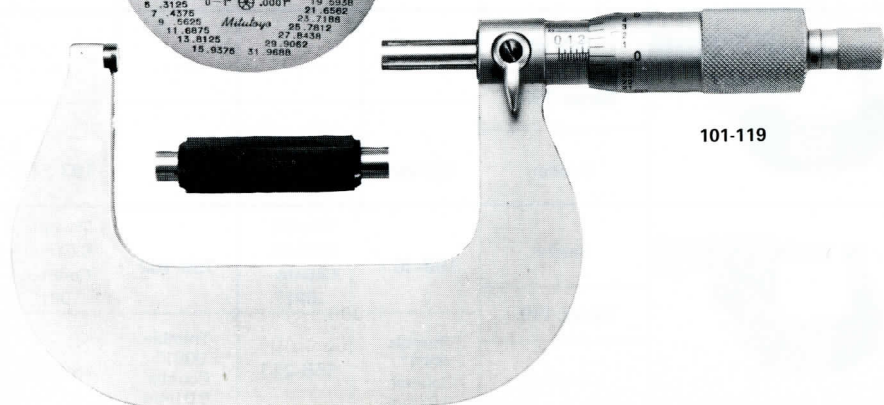
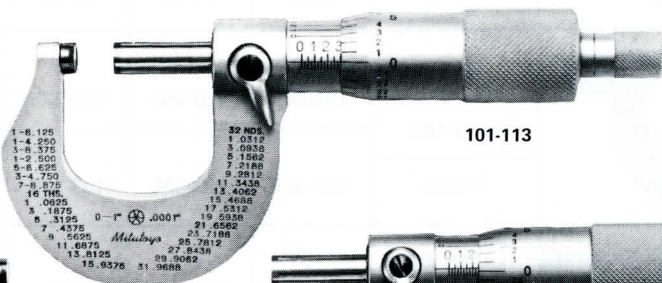
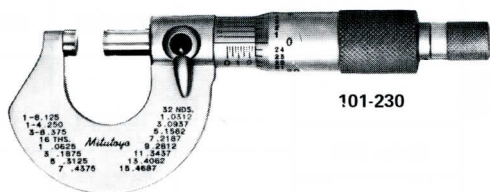
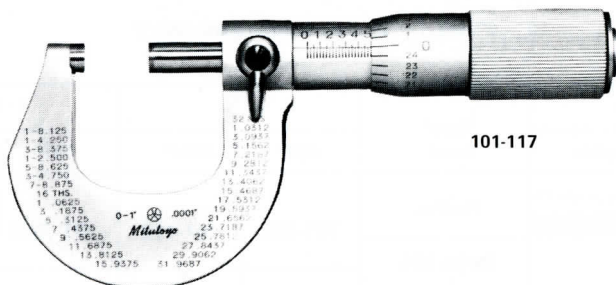
OUTSIDE MICROMETERS — SELECTION GUIDE

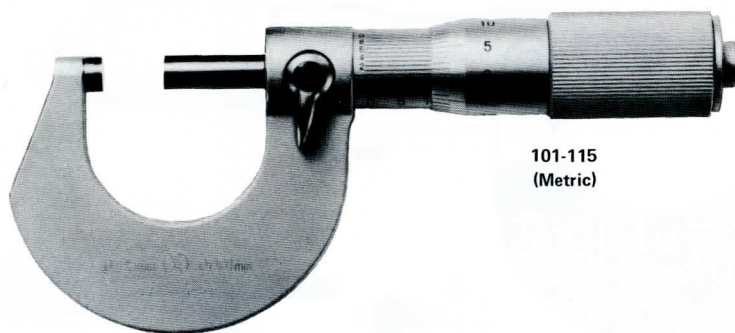
0 — 1" and 1 — 2" MICROMETERS ONLY

Range	Type/ Series	0 - 1"		1 - 2"	
Graduation		.001"	.0001"	.001"	.0001"
	Ratchet	101-105	101-113	101-1061	101-114
	Series 101				
	Friction	101-109	101-117	101-110	----
	Ratchet	----	102-121	----	102-122
	Series 102				
	Friction	----	102-124	102-224	102-226
	Ratchet	103-177 103-259	103-260	103-178	103-262
	Series 103				
	Friction	103-127	103-135	103-128	103-136
	Ratchet	----	----	----	----
	Series 193				
	Friction	193-201	193-211	----	193-212
	Ratchet	159-101	Thimble 0.01mm Counter .001"	159-102	Thimble 0.01mm Counter .001"
	Series 159				
	Friction	Thimble .0001" Counter 0.01mm	159-211	Thimble .0001" Counter 0.01mm	159-212



OUTSIDE MICROMETERS Series 101



101-115
(Metric)

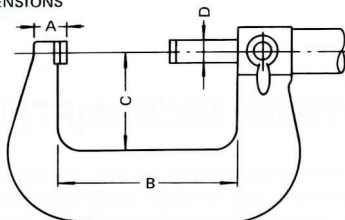
OUTSIDE MICROMETERS Series 101

MITUTOYO's Series 101 Micrometers are one of the basic and most popular of all Micrometers. They feature functional and balanced design. Their satin-chrome-finished, forged-steel frames are tapered at the anvil side and made with a deep U throat to improve accessibility to hard-to-get-at locations. Both anvil and spindle measuring faces are carbide tipped and micro-lapped to provide a high degree of flatness and parallelism, resulting in greater accuracy, and longer tool life.

The diameter of the measuring faces is .250" which is a standard specification on Series 101, 102 and 103 (up to 12" range). Standard Bar is supplied with the micrometer along with a fitted carrying case.

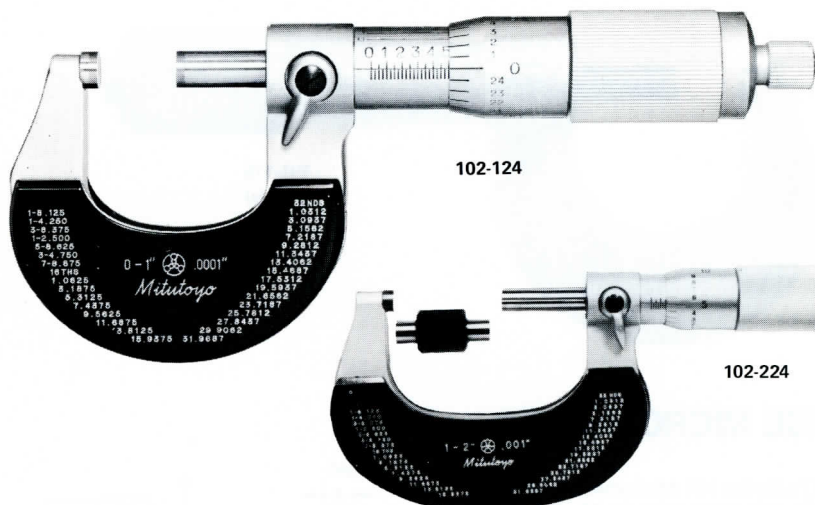
For other specifications, see pages 8 thru 11.

DIMENSIONS



Dimensions	Range	A	B	C	D
	0-1/2"	.31"	.78"	.76"	.250"
	0-1"	.31"	1.18"	1.11"	.250"
	1-2"	.41"	2.15"	1.25"	.250"
	2-3"	.44"	3.17"	1.78"	.250"
	3-4"	.43"	4.17"	2.26"	.250"

INCH					METRIC				
Range	No.	Grad.	Type	Remarks	Range	No.	Grad.	Type	Remarks
0 - 1/2"	101-230	.0001"	Ratchet	---					
0 - 1"	101-105	.001"	Ratchet	---					
0 - 1"	101-109	.001"	Friction	---					
0 - 1"	101-113	.0001"	Ratchet	---					
0 - 1"	101-117	.0001"	Friction	---					
1 - 2"	101-106	.001"	Ratchet	w/Standard					
1 - 2"	101-110	.001"	Friction	w/Standard					
1 - 2"	101-114	.0001"	Ratchet	w/Standard					
2 - 3"	101-119	.0001"	Ratchet	w/Standard					
3 - 4"	101-120	.0001"	Ratchet	w/Standard					
					0 - 25mm	101-107	0.01mm	Friction	
					0 - 25mm	101-111	0.001mm	Ratchet	
					0 - 25mm	101-115	0.001mm	Friction	
					25 - 50mm	101-108	0.01mm	Friction	w/Standard
					25 - 50mm	101-112	0.001mm	Ratchet	w/Standard
					25 - 50mm	101-116	0.001mm	Friction	w/Standard



102-124

102-224

OUTSIDE MICROMETERS Series 102

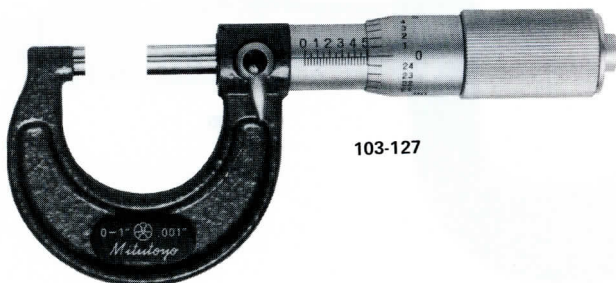
102 series micrometers are deluxe version of 101 series. A pair of black heat-insulating grip plates, with highly legible fraction to decimal equivalent table, are attached on the frame. The fraction thimble has a speeder to quickly open and close the spindle.

Note 102 series inch models are featured with fraction to decimal equivalent table. Metric models have no engravings on the heat-insulating grip plates.

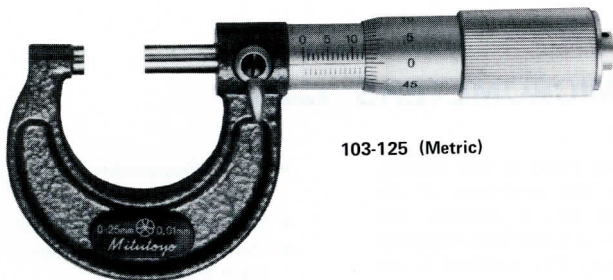
The micrometer comes with a friction thimble or ratchet stop to ensure consistent measuring pressure, and reduce discrepancies in final readings from one inspector to another.

- Decimal equivalents on frame.
- Clear graduations on satin chrome finish.
- Every thousandth is numbered for easy reading.
- Deluxe heat-insulated frame.
- Quick and easy zero adjustment.
- Diameter of the measuring faces .250".
- Complete with fitted carrying case.

INCH				METRIC			
Range	No.	Grad.	Type	Range	No.	Grad.	Type
0 - 1"	102-124	.0001"	Friction	0-25mm	102-123	0.001mm	Friction
0 - 1"	102-121	.0001"	Ratchet	0-25mm	102-217	0.01mm	Ratchet
				0-25mm	102-221	0.01mm	Friction
1 - 2"	102-224	.001"	Friction w/ Standard	25-50mm	102-222	0.01mm	Friction w/ Standard
1 - 2"	102-226	.0001"	Friction w/ Standard	25-50mm	102-225	0.001mm	Friction w/ Standard
1 - 2"	102-122	.0001"	Ratchet w/ Standard				



103-127

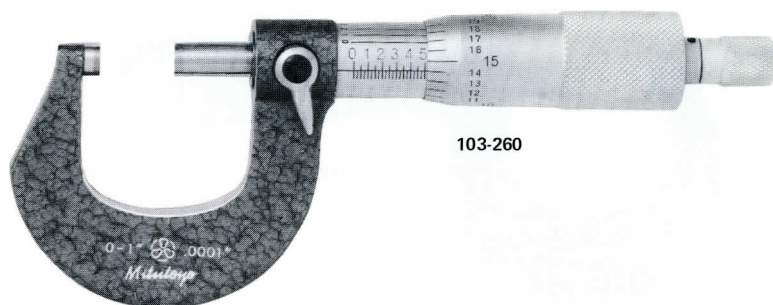


103-125 (Metric)

OUTSIDE MICROMETERS Series 103

- Flatness .00003"
- Parallelism .00005" for 0-1".
- Accuracy .0001".
- Carbide faces.
- Positive locking clamp.
- Friction thimble for exact repetitive readings.
- Anvil and spindle hardened and precision ground — with micro-lap finish on ends.
- Hammertone green baked enamel finished frame.
- Clear graduations on satin chrome finish.
- Every thousandth is numbered for easy reading.
- Quick and easy zero adjustment.
- Diameter of measuring faces .250".
- Complete with fitted carrying case.

INCH				METRIC			
Range	No.	Grad.	Type	Range	No.	Grad.	Type
0 - 1"	103-127	.001"	Friction	0-25mm	103-125	0.01mm	Friction
0 - 1"	103-177	.001"	Ratchet	0-25mm	103-133	0.001mm	Friction
0 - 1"	103-135	.0001"	Friction	25-50mm	103-126	0.01mm	Friction w/ Standard
1 - 2"	103-128	.001"	Friction w/ Standard				
1 - 2"	103-136	.0001"	Friction w/ Standard				



103-260

OUTSIDE MICROMETERS Series 103

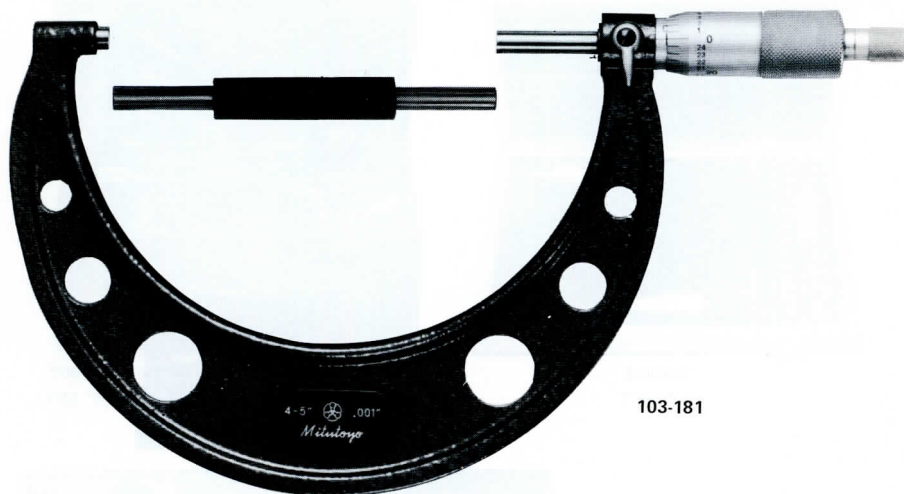
Ratchet Stop Type

Among many series listed in this catalog, the 103 series is the workhorse of the micrometer. Up to 12" or 300mm, 103 series micrometer is automatically supplied with a standard bar. The standard is not supplied for the micrometers larger than 13". You can select either .001" or .0001" smallest graduation up to 12" range. The 103 series micrometer sets are also available with .001" or .0001" graduation.

- Every thousandth is numbered for easy reading.
- Quick and easy zero adjustment.
- Hammertone green baked enamel finished frame.
- Diameter of measuring faces:
 .250" 0" to 12"
 .315" 12" to 40"
- Complete with fitted carrying case.

INCH						METRIC		
Graduation .001"			Graduation .0001"			Range	No.	Grad.
Range	No.	Grad.	Range	No.	Grad.			
0-1"	103-259	.001"	0-1"	103-260	.0001"	0-25mm	103-137	0.01mm
1-2"	103-178	.001"*	1-2"	103-262	.0001"*	25-50mm	103-138	0.01mm *
2-3"	103-179	.001"*	2-3"	103-217	.0001"*	50-75mm	103-139	0.01mm *
3-4"	103-180	.001"*	3-4"	103-218	.0001"*	75-100mm	103-140	0.01mm *
4-5"	103-181	.001"*	4-5"	103-219	.0001"*	100-125mm	103-141	0.01mm *
5-6"	103-182	.001"*	5-6"	103-220	.0001"*	125-150mm	103-142	0.01mm *
6-7"	103-183	.001"*	6-7"	103-221	.0001"*	150-175mm	103-143	0.01mm *
7-8"	103-184	.001"*	7-8"	103-222	.0001"*	175-200mm	103-144	0.01mm *
8-9"	103-185	.001"*	8-9"	103-223	.0001"*	200-225mm	103-145	0.01mm *
9-10"	103-186	.001"*	9-10"	103-224	.0001"*	225-250mm	103-146	0.01mm *
10-11"	103-187	.001"*	10-11"	103-225	.0001"*	250-275mm	103-147	0.01mm *
11-12"	103-188	.001"	11-12"	103-226	.0001"	275-300mm	103-148	0.01mm *

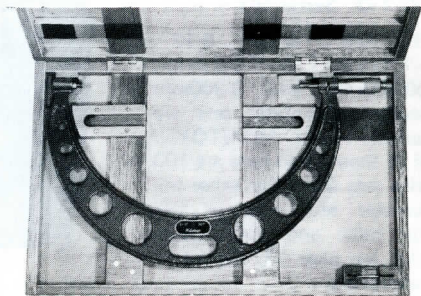
*Supplied with standard



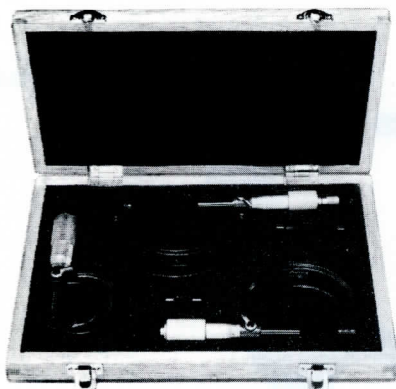
103-181

Range	No.	Graduation
12-13"	103-189	.001" without standard
13-14"	103-190	.001" without standard
14-15"	103-191	.001" without standard
15-16"	103-192	.001" without standard
16-17"	103-193	.001" without standard
17-18"	103-194	.001" without standard
18-19"	103-195	.001" without standard
19-20"	103-196	.001" without standard
20-21"	103-197	.001" without standard
21-22"	103-198	.001" without standard
22-23"	103-199	.001" without standard
23-24"	103-200	.001" without standard
24-25"	103-201	.001" without standard
25-26"	103-202	.001" without standard
26-27"	103-203	.001" without standard
27-28"	103-204	.001" without standard
28-29"	103-205	.001" without standard
29-30"	103-206	.001" without standard
30-31"	103-207	.001" without standard
31-32"	103-208	.001" without standard
32-33"	103-209	.001" without standard
33-34"	103-210	.001" without standard

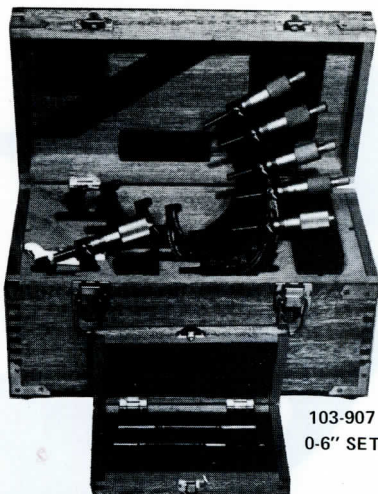
Range	No.	Graduation
34-35"	103-211	.001" without standard
35-36"	103-212	.001" without standard
36-37"	103-213	.001" without standard
37-38"	103-214	.001" without standard
38-39"	103-215	.001" without standard
39-40"	103-216	.001" without standard



Large Outside Micrometers listed on this page are supplied with fitted case, but without standard.
See Micrometers Standards page for more information.



103-922
0-3" SET



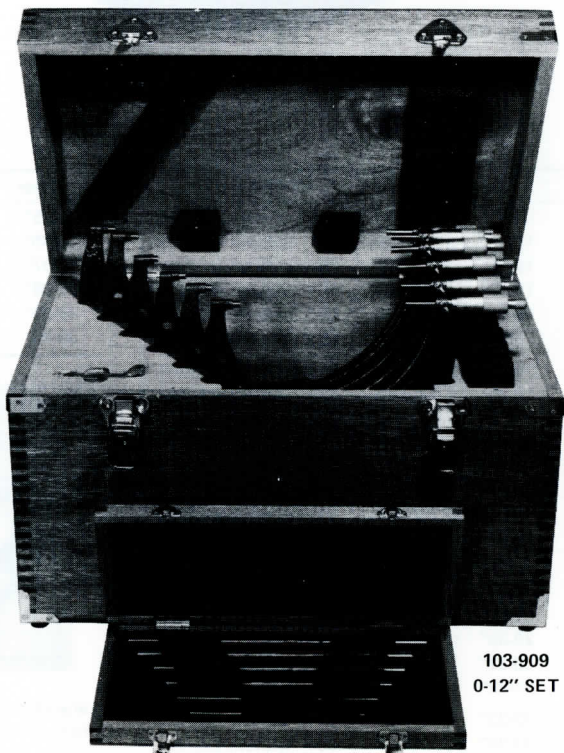
103-907
0-6" SET

MICROMETER SETS

Series 103

0-3", 0-6", 6-12", 0-12",
0-75 mm, 0-150 mm,
150-300 mm and 0-300 mm
outside micrometer sets are
available from MITUTOYO.
All of them listed here are 103
series sets only. For other mi-
crometer sets, such as 193
digit mike and 159 Combi-
mike, see page 13, 15 and 17
respectively.

All our micrometer sets are
furnished with a set of stan-
dards and rugged wooden car-
rying case.



103-909
0-12" SET



INCH MICROMETER SETS .001" Graduation

Individual Micrometers

Range	No.	Range	No.	Range	No.	Graduation
0 - 12" SET with 11 Standards		0 - 3" SET (with 2 Standards)	103-929	0 - 1"	103-177	.001"
				1 - 2"	103-178	.001"
				2 - 3"	103-179	.001"
	103-905	0 - 6" SET (with 5 Standards)	103-904	0 - 1"	101-105	.001"
				1 - 2"	101-106	.001"
				2 - 3"	103-179	.001"
				3 - 4"	103-180	.001"
				4 - 5"	103-181	.001"
				5 - 6"	103-182	.001"
		6 - 12" SET (with 6 Standards)	103-906	6 - 7"	103-183	.001"
				7 - 8"	103-184	.001"
				8 - 9"	103-185	.001"
				9 - 10"	103-186	.001"
				10 - 11"	103-187	.001"
				11 - 12"	103-188	.001"

INCH MICROMETER SETS .0001" Graduation

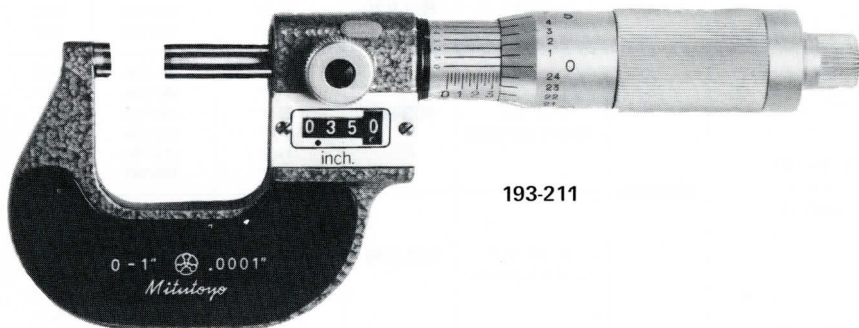
Individual Micrometers

0 - 12" SET with 11 Standards		0 - 3" SET (with 2 Standards)	103-922	0 - 1"	103-135	.0001"
				1 - 2"	103-136	.0001"
				2 - 3"	103-217	.0001"
	103-908	0 - 6" SET (with 5 Standards)	103-907	0 - 1"	103-135	.0001"
				1 - 2"	103-136	.0001"
				2 - 3"	103-217	.0001"
				3 - 4"	103-218	.0001"
				4 - 5"	103-219	.0001"
				5 - 6"	103-220	.0001"
		6 - 12" SET (with 6 Standards)	103-909	6 - 7"	103-221	.0001"
				7 - 8"	103-222	.0001"
				8 - 9"	103-223	.0001"
				9 - 10"	103-224	.0001"
				10 - 11"	103-225	.0001"
				11 - 12"	103-226	.0001"

METRIC MICROMETER SETS 0.01mm Graduation

Individual Micrometers

0 - 300mm SET with 11 Standards		0 - 75mm SET (with 2 Standards)	103-927	0 - 25mm	103-137	0.01mm
				25 - 50mm	103-138	0.01mm
				50 - 75mm	103-139	0.01mm
	103-914	0 - 150mm SET (with 5 Standards)	103-913	0 - 25mm	101-103	0.01mm
				25 - 50mm	101-104	0.01mm
				50 - 75mm	103-139	0.01mm
				75 - 100mm	103-140	0.01mm
				100 - 125mm	103-141	0.01mm
				125 - 150mm	103-142	0.01mm
		150 - 300mm SET (with 6 Standards)	103-915	150 - 175mm	103-143	0.01mm
				175 - 200mm	103-144	0.01mm
				200 - 225mm	103-145	0.01mm
				225 - 250mm	103-146	0.01mm
				250 - 275mm	103-147	0.01mm
				275 - 300mm	103-148	0.01mm



193-211

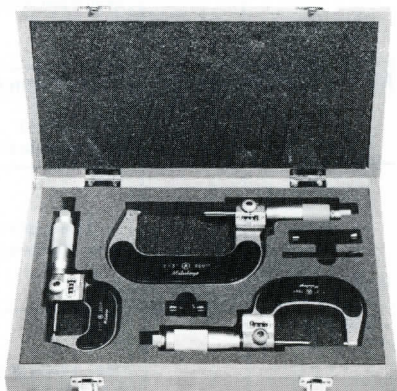
DIGIT-OUTSIDE MICROMETERS Series 193

Direct Digital Read-Out

The time-saving MITUTOYO Digit Micrometers, used extensively in the metal working and other measurement sensitive industries, offer several advantages over conventional reading micrometers. One of its contributions to the industry is that it virtually eliminate costly reading errors in gaging. Mitutoyo Digit Micrometers proved that inspection time can be drastically reduced, and even unskilled workers can measure workpieces precisely.

- Flatness on measuring face .000030".
- Parallelism .000050" (1" model).
- Accuracy .0001".
- Carbide-tipped measuring faces.
- Positive-locking nut on spindle.
- Friction stop featured with 1" and 2" models assures uniform gaging pressure.
- 3" models and up, and all metric Digit Micrometers come with ratchet stop.
- Quick, easy zero adjustment on the sleeve. Wrench is furnished with each micrometer.

- Satin-chromed sleeve and thimble with clear graduations.
- Diameter of spindle .250" (up to 4").
- Complete with carrying case and standard.



The Mitutoyo Digit Micrometer is available individually or in sets in Inch and Metric.



DIGIT-OUTSIDE MICROMETERS

Direct Digital Read-Out, Series 193

The larger Digit Micrometers (5" model and up) are equipped with .314" dia. spindle, instead of standard .250", and equally large digital counter for ease of reading.

The digits shown on the counter can be manually zero-adjusted irrespective of the actual dimensions between anvil and spindle.

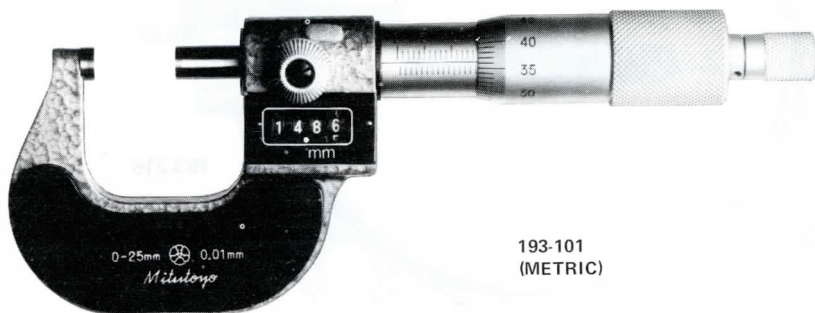
If the counter should drift, simple adjustment of the counter will bring zero point in position.

- Rigid perforated frame.
- Anvil and Spindle diameter .250" up to 4", .314" over 4", with carbide measuring faces.
- Quick and easy counter adjustment over 4".
- Satin-chromed sleeve and thimble.
- Ratchet stop from 3" model and up (1" and 2" models with friction thimble)
- Supplied with standard fitted carrying case. Instructions included.

Range	No.	Graduation
0-1"	193-201	.001"
0-1"	193-211	.0001"
1-2"	193-212	.0001" with standard
2-3"	193-213	.0001" with standard
3-4"	193-214	.0001" with standard
4-5"	193-215	.0001" with standard
5-6"	193-216	.0001" with standard
6-7"	193-217	.0001" with standard
7-8"	193-218	.0001" with standard
8-9"	193-219	.0001" with standard
9-10"	193-220	.0001" with standard
10-11"	193-221	.0001" with standard
11-12"	193-222	.0001" with standard

DIGIT MICROMETER SETS

0-3"	193-923	.0001" with standards
0-6"	193-925	.0001" with standards
6-12"	193-927	.0001" with standards



193-101
(METRIC)

DIGIT OUTSIDE MICROMETERS Series 193

The new 193 Series Digital Micrometer measures Metric dimensions faster and easier than any other measuring instrument, regardless of the inspector's skill and experience in Metric gaging.

The reading is simplicity itself. There is virtually no way of miscalculating or misreading this micrometer.

Although conventional thimble and sleeve may not be read frequently, they are incorporated in this series to verify the digital counter's readings and indicating accuracy.

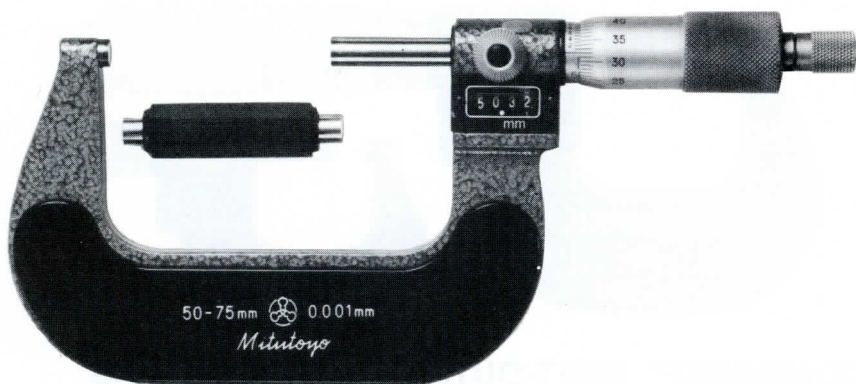
0-75mm, 0-150mm and 150-300mm digit mike sets are available from MITUTOYO.

0-75mm sets are offered with 0.01mm or 0.001mm graduations. All of them are supplied with standards and fitted, rugged wooden case. For other Metric micrometer sets, see page 11. For Combimike sets, see page 16.

- Carbide measuring faces.
- Read directly to one hundredth of a millimeter in digits.
- Ratchet stop on all models.
- Crisp, clear reversed numbers on the digital counter.
- Heat-insulating grip plate on the frame.
- Complete with fitted carrying case.



193-901



193-113
(METRIC)

DIGIT-OUTSIDE MICROMETERS Series 193

In the conventional Metric micrometer reading, one must be careful not to omit 0.5mm graduations engraved on the micrometer's sleeve.

However, when a digital counter is provided, such as the 193 series listed here, no one would misread the metric value shown in the digit clearly to 0.01mm. The advantage of the Metric digit micrometers is obvious. If you are not so sure about 0.5mm pitch thread, select MITUTOYO's 193 series.

Ratchet stop is a standard feature with all Metric digit micrometers. Friction type thimble is not available.

Range	No.	Graduation
0-25mm	193-101	0.01mm
0-25mm	193-111	0.001mm
25-50mm	193-102	0.01mm w/ standard
25-50mm	193-112	0.001mm w/ standard
50-75mm	193-103	0.01mm w/ standard
50-75mm	193-113	0.001mm w/ standard
75-100mm	193-104	0.01mm w/ standard
75-100mm	193-114	0.001mm w/ standard
100-125mm	193-105	0.01mm w/ standard
125-150mm	193-106	0.01mm w/standard
150-175mm	193-107	0.01mm w/standard
175-200mm	193-108	0.01mm w/standard
200-225mm	193-109	0.01mm w/standard
225-250mm	193-110	0.01mm w/standard
250-275mm	193-131	0.01mm w/standard
275-300mm	193-132	0.01mm w/standard

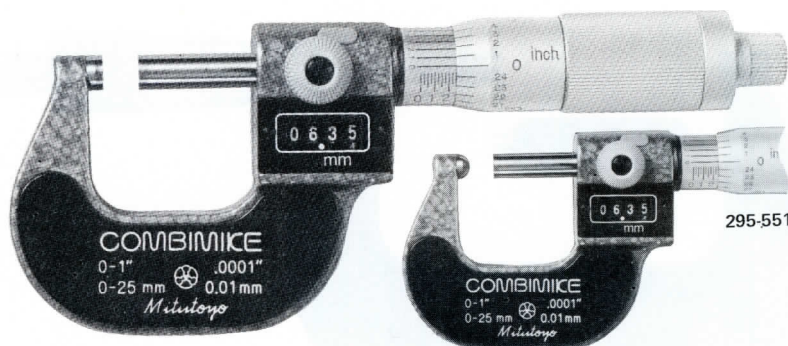
DIGIT OUTSIDE MICROMETER SETS

0-75mm	193-901	0.01mm w/ standard
0-75mm	193-915	0.001mm w/ standard
0-150mm	193-903	0.01mm w/ standard
150-300mm	193-905	0.01mm w/ standard

To those who wish to know more about Metric micrometer reading, we have prepared a guide book on how to read metric and inch micrometers. To get your copy, contact local MTI office.



159-211



295-551

“COMBIMIKE” DIGIT-OUTSIDE MICROMETERS

Combination Inch—Metric Micrometers Series 159, 295

The new MITUTOYO “Combimike” reads both Inch and Metric dimensions simultaneously as the Spindle rotates.

It indicates Inch value on the Thimble, while its Metric equivalent is registered on the Digital Counter.

In the case of No. 159-211 shown above, the reading on the Thimble is .250”.

The Metric equivalent is 6.35mm exactly. For those who already converted to Metric blue prints, MITUTOYO offers “Combimikes” with Metric Thimble and Inch Counter. The new “Combimike” is also available with Spherical Anvil and Spindle (Series 295).

	Range		No.	Graduation	
	Thimble	Counter		Thimble	Counter
Individual COMBIMIKE	0-1"	00.00-25.40mm	159-211*	.0001"	0.01mm
	1-2"	25.40-50.80mm	159-212*	.0001"	0.01mm w/standard
	2-3"	50.80-76.20mm	159-213	.0001"	0.01mm w/standard
	3-4"	76.20-101.60mm	159-214	.0001"	0.01mm w/standard
	4-5"	101.60-127.00mm	159-215	.0001"	0.01mm w/standard
	5-6"	127.00-152.40mm	159-216	.0001"	0.01mm w/standard
	6-7"	152.40-177.80mm	159-217	.0001"	0.01mm w/standard
	7-8"	177.80-203.20mm	159-218	.0001"	0.01mm w/standard
	8-9"	203.20-228.60mm	159-219	.0001"	0.01mm w/standard
	9-10"	228.60-254.00mm	159-220	.0001"	0.01mm w/standard
	10-11"	254.00-279.40mm	159-221	.0001"	0.01mm w/standard
	11-12"	279.40-304.80mm	159-222	.0001"	0.01mm w/standard
COMBIMIKE Sets	0-3"	00.00-76.20mm (Includes 159-211, 159-212 and 159-213)	159-923	.0001"	0.01mm w/standard
	0-6"	00.00-152.40mm (Includes 159-211, 159-212, 159-213, 159-214, 159-215, 159-216)	159-925	.0001"	0.01mm w/standard
Spherical Type	0-1"	00.00-25.40mm	295-551	.0001"	0.01mm Spherical anvil
	0-1"	00.00-25.40mm	295-651	.0001"	0.01mm Spherical anvil and spindle tip

* Friction Thimbles all others have Ratchet Stop



“COMBIMIKE” DIGIT-OUTSIDE MICROMETERS

Combination Metric-Inch Micrometers. Series 159

This COMBIMIKE is an identical model to the one described on the opposite page, except the English (inch) and Metric readings are reversed. The English reading (in inches) now shows up on the Digital Counter, while the Metric reading is taken from the Thimble. Basically, this is a Metric Micrometer which shows its English equivalent in digits.

In Figure 2 below, the thimble is positioned at 12.70mm while its English equivalent (0.500" exactly) shows on the Digital Counter.

All MITUTOYO Micrometers meet or exceed Federal Specifications for accuracy.

- Flatness, Anvil and Spindle .0003mm
- Parallelism .0006mm
- Accuracy .001mm (Thimble).
- Diameter of measuring faces 6.35mm
- Positive locking clamp.
- Ratchet stop for exact and repetitive readings.
- With heat-insulating grip plates.
- Clear graduations on satin chrome finish.

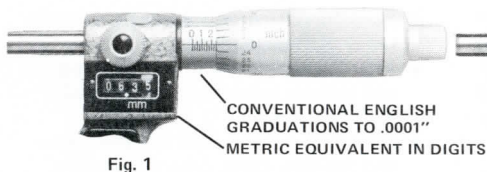


Fig. 1

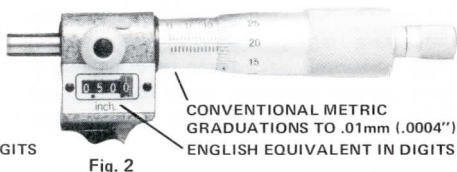
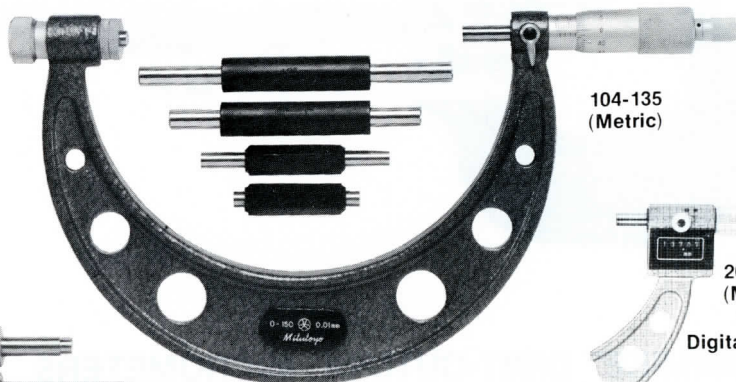
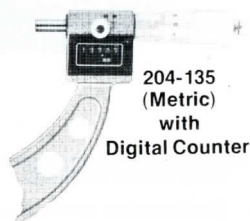


Fig. 2

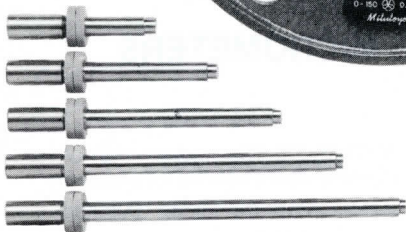
Range		No.	Graduation	
Thimble	Counter		Thimble	Counter
0-25mm	0 - 1"	159-101	0.01mm	.001"
25-50mm	1 - 2"	159-102	0.01mm	.001"
50-75mm	2 - 3"	159-103	0.01mm	.001"
75-100mm	3 - 4"	159-104	0.01mm	.001"



104-135
(Metric)



204-135
(Metric)
with
Digital Counter



OUTSIDE MICROMETERS

Series 104, 204

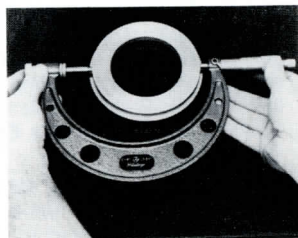
Interchangeable Anvils

The Interchangeable Anvil Micrometer is capable of measuring any dimension up to 600mm. This wide-range capability makes the micrometer highly desirable when several works of various sizes are to be inspected. It offers greater economy, equal accuracy and range when compared with 6 individual micrometers.

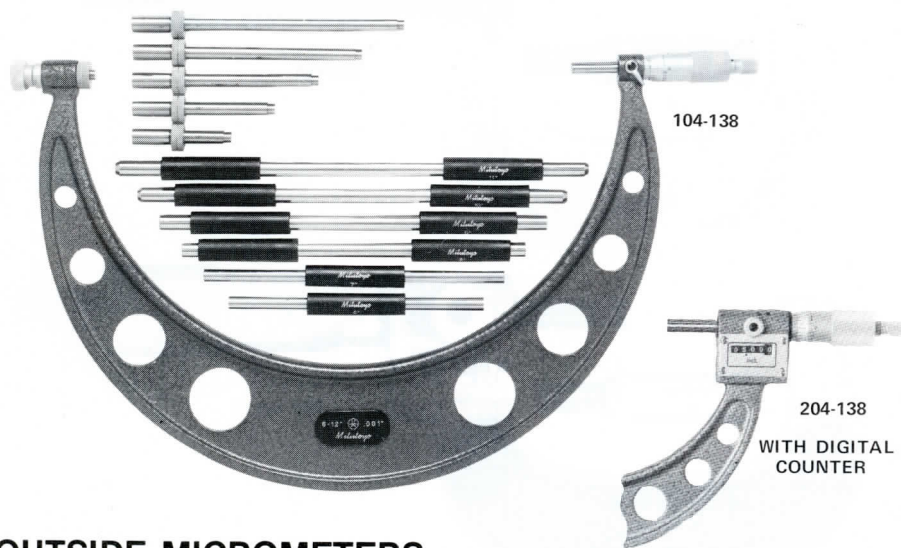
Furnished anvils are quickly interchanged, and are etched with the length.

An adjustable stopper is provided on the anvil to alter the overall anvil dimension.

The diameters of the anvils are 8mm., micro-lapped but without carbide tip. Spindle diameter is also 8mm., carbide tipped and micro-lapped for lasting accuracy.



- Easy interchangeable anvils permit wide range of measurements.
- Interchangeable anvils, setting standards and spanner wrench are supplied with each micrometer.
- Glare-free satin chrome finished sleeve and thimble. Clear, crisp graduations.
- Ratchet stop for consistent measurements.
- Carbide measuring face on the spindle. No carbide tip on the anvils.
- Spindle and anvil diameter: 8mm.
- The frame is ribbed for strength and stability, and perforated for lightness.
- Complete with fitted carrying case.

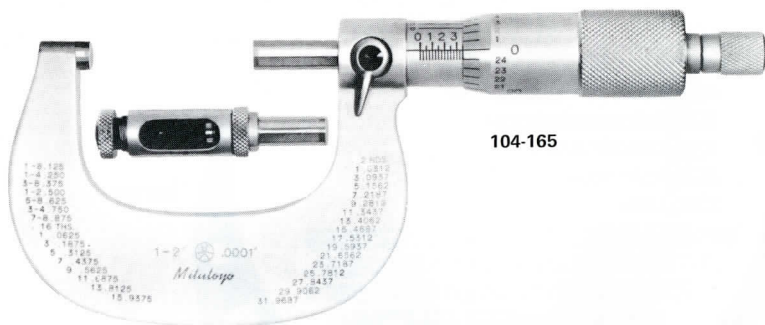


OUTSIDE MICROMETERS Series 104, 204

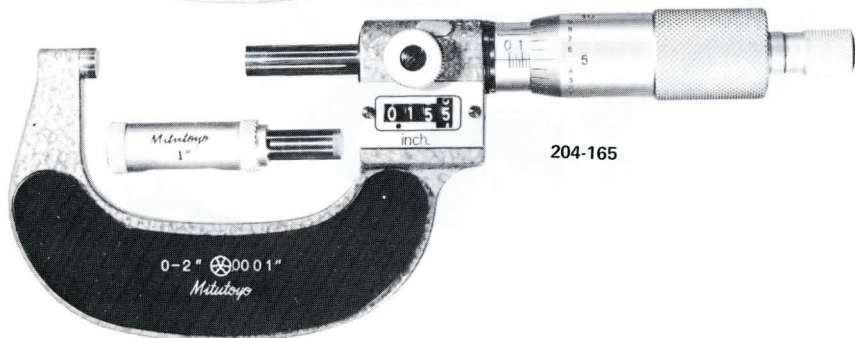
Interchangeable Anvil

INCH	Range	No.	Graduation	METRIC	Range	No.	Graduation
6" Steps	0 – 6"	104-137	.001"	150mm Steps	0 – 150mm	104-135	0.01mm
	6 – 12"	104-138	.001"		150 – 300mm	104-136	0.01mm
	12 – 18"	104-201	.001"				
	18 – 24"	104-202	.001"				
	24 – 30"	104-203	.001"				
	30 – 36"	104-204	.001"				
	36 – 42"	104-205	.001"				
4" Steps	12 – 16"	104-152	.001"	100mm Steps	300 – 400mm	104-142	0.01mm
	16 – 20"	104-153	.001"		400 – 500mm	104-143	0.01mm
	20 – 24"	104-154	.001"		500 – 600mm	104-144	0.01mm
	24 – 28"	104-155	.001"		600 – 700mm	104-145	0.01mm
	28 – 32"	104-156	.001"		700 – 800mm	104-146	0.01mm
	32 – 36"	104-157	.001"		800 – 900mm	104-147	0.01mm
	36 – 40"	104-158	.001"		900 – 1000mm	104-148	0.01mm
With Digital Counter	0 – 6"	204-137	.001"	With Digital Counter	0 – 150mm	204-135	0.01mm
	6 – 12"	204-138	.001"		150 – 300mm	204-136	0.01mm
	12 – 18"	204-201	.001"				
	18 – 24"	204-202	.001"				

All Series 104, 204 Micrometers listed above are supplied with Anvils, Standards and Carrying Case.



104-165



204-165

OUTSIDE MICROMETERS

Interchangeable Anvils

Series 104, 204

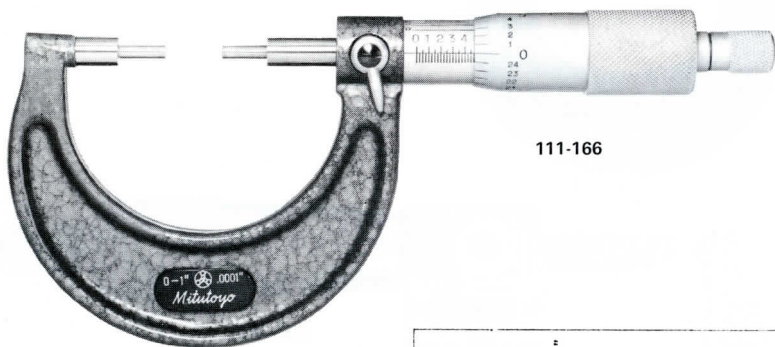
All MITUTOYO Micrometers meet or exceed Federal Specifications for accuracy.

With a special 1" anvil attachment (Part No. 950657), the regular 1-2" range micrometers will measure 0-1" as well as 1-2". The attachment can be quickly mounted on the anvil, and securely locked by the clamp. Since the length of the attachment is 1" exact, the micrometer can always be self-checked at 1". Measuring face of the attachment is also carbide.

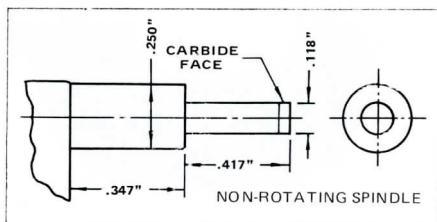
- Every thousandth's numbered for easy reading.
- Quick and easy zero adjustment.
- Micro-lap finish on anvil and spindle faces.
- Anvil attachment permits measurements 0-1", without attachment 1-2".
- Diameter of measuring faces .250".
- Complete with fitted carrying case.

Parts No.	Description
950657	1" Anvil attachment

	Range	No.	Graduation	Type
INCH	0 - 2"	104-165	.0001"	Ratchet Stop
	0 - 2"	204-165	.0001" with Digital Counter	Ratchet Stop
METRIC	0 - 50mm	104-167	.001mm	Ratchet Stop



111-166



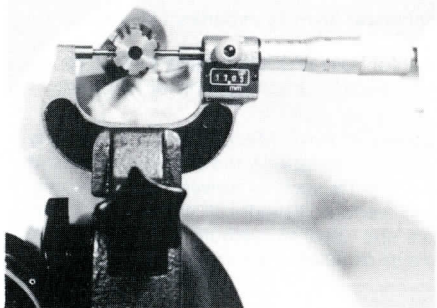
OUTSIDE MICROMETERS

Series 111, 131 Spline Type

As the name implies, this special micrometer is for measuring splines, slots, keyways, etc., where regular micrometer's .250" dia. measuring faces cannot be applied.

The Spline Micrometer has .118" dia. spindle and anvil which are carbide tipped for greater accuracy and long life.

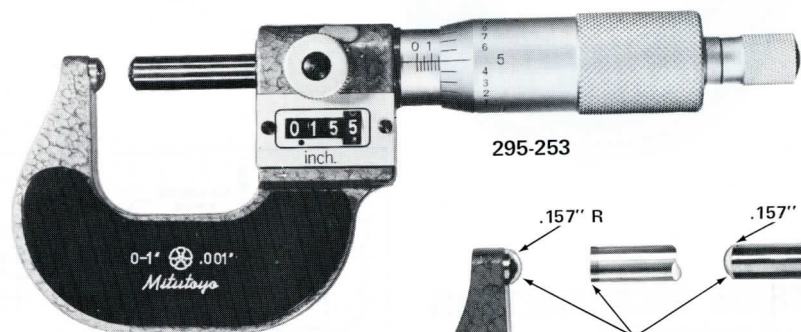
- Measuring face flatness .00002".
- Parallelism between the faces .00005".
- Accuracy .0001".
- With ratchet stop, locking clamp and satin-chromed sleeve and thimble.
- Supplied with fitted carrying case.



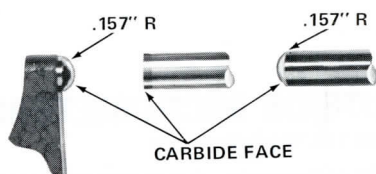
	Range	No.	Thimble	Counter	Description
INCH	0 - 1"	111-166	.0001"	.001"	with Digital Counter
	0 - 1"	131-166	.0001"		
METRIC	0 - 25mm	111-115	0.01mm	.01mm	with Digital Counter
	0 - 25mm	131-115	0.01mm		



115-153



295-253



OUTSIDE MICROMETERS

Spherical Anvil Type Series 115, 295

All MITUTOYO Micrometers meet or exceed Federal Specifications for accuracy.

Spherical Anvil Micrometers are specially useful in measuring the wall thicknesses of small parts such as sleeves, collars, tubings and various cylindrical workpieces. They are also used to measure dimensions from inside of holes to outside edges.

The spherical anvil contacts the inside curved surface providing a single point contact and permitting accurate gaging of the wall thickness to .0001".

- Carbide tipped measuring faces (anvil and spindle).
- Ratchet stop for exact and repetitive reading.

Inch

Range	No.	Remarks	Graduation
0-1"	115-153	Spherical Anvil	.0001"
0-1"	115-253	Spherical Anvil and Spindle	.0001"

With Digital Counter

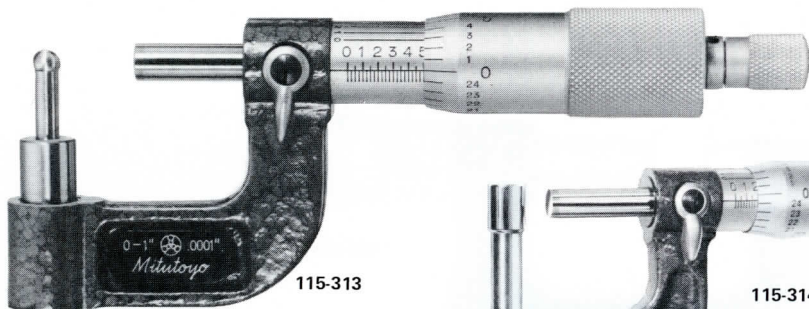
0-1"	295-153	Spherical Anvil	.0001"
0-1"	295-253	Spherical Anvil and Spindle	.0001"

Metric

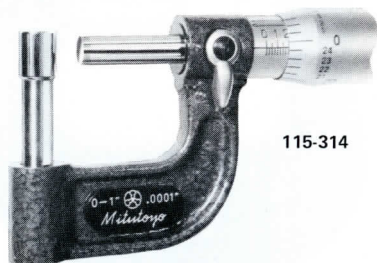
0-25mm	115-115	Spherical Anvil	0.01mm
0-25mm	115-215	Spherical Anvil and Spindle	0.01mm

With Digital Counter

0-25mm	295-115	Spherical Anvil	0.01mm
0-25mm	295-215	Spherical Anvil and Spindle	0.01mm



115-313



115-314

DIMENSIONS

No. 115-314 295-314 295-704	No. 115-313 295-313 295-703	No. 115-308 (Metric)	



115-308

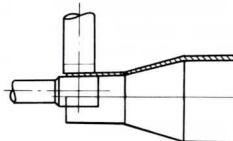
295-313

OUTSIDE MICROMETERS

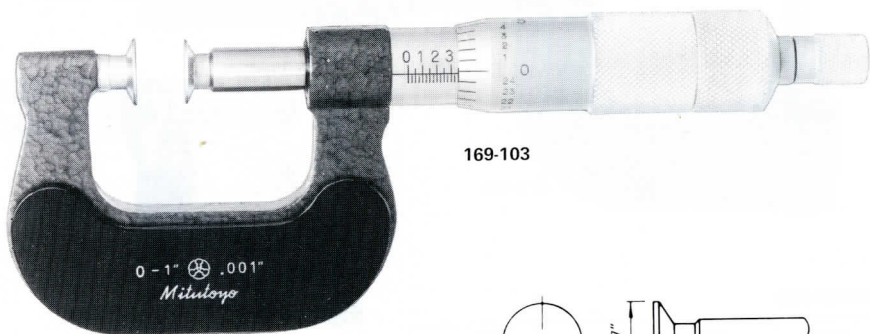
Series 115, 295 Spherical Anvil Type

Tubing type Micrometers are highly useful and versatile tools used primarily to measure wall thicknesses of tubings and other parts with cylindrical walls. Dimensions between a hole to an edge of other shaped pieces can also be measured with these micrometers.

MEASURING EXAMPLE



	Range	No.	Graduation	Dia. of Anvil	Description	
INCH	0-1"	115-313	.0001"	.187"	with Digital Counter with Digital Counter	
	0-1"	115-314	.0001"	.315"		
	0-1"	295-313	.0001"	.187"		
	0-1"	295-314	.0001"	.315"		
METRIC	0-25mm	115-308	0.01mm	3.5mm		
	Range	Counter Range	No.	Thimble Grad.	Counter Grad.	Dia. of Anvil
COMBIMIKE	0-1"	00.00-25.40mm	295-703	.0001"	0.01mm	.187"
	0-1"	00.00-25.40mm	295-704	.0001"	0.01mm	.315"



169-103

OUTSIDE MICROMETERS

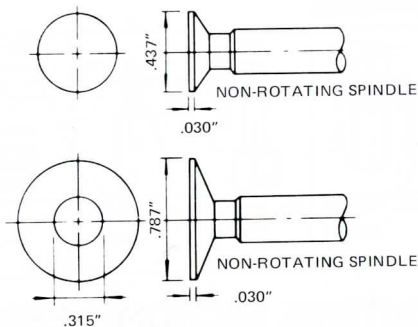
Disc Type Series 169

Non-rotating spindle micrometer—

The non-rotating spindle micrometer has an advantage over rotating disc micrometers described on the preceding page.

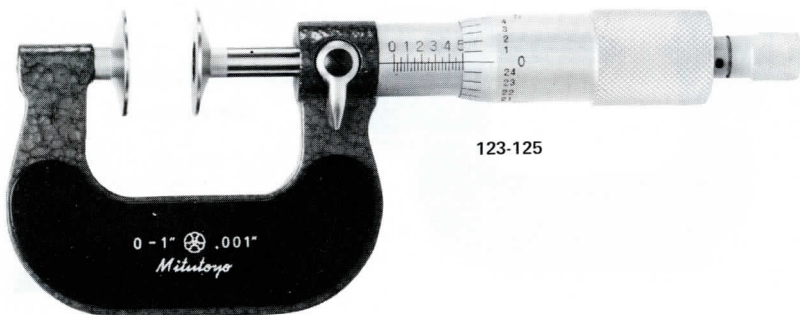
It does not create radial torsion on the measuring faces, and is recommended for measuring fragile workpieces, coated metal plates, laminated sheets, Mylar-based films, etc.

- Overall accuracy: $\pm .00016''$
- Parallelism: $.00012''$ for $.437''$ dia. Disc
 $.00016''$ for $.787''$ dia. Disc.
- Disc flatness: $.00004''$



- Measuring discs are hardened, ground and micro-lapped for greater accuracy.
- Satin-chromed, glare-free sleeve and thimble, clear, sharp graduations. With ratchet stop.
- High standard of MITUTOYO quality throughout.
- Supplied with fitted carrying case.

Range	No.	Graduation	Dia. of Disc	Remarks
0-1"	169-103	.001"	.437"	Non-rotating Spindle
0-1"	169-203	.001"	.787"	Non-rotating Spindle
1-2"	169-204	.001"	.787"	with Standard Non-rotating Spindle
2-3"	169-206	.001"	.787"	with Standard Non-rotating Spindle
3-4"	169-208	.001"	.787"	with Standard Non-rotating Spindle



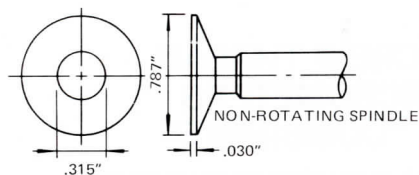
123-125

OUTSIDE MICROMETERS

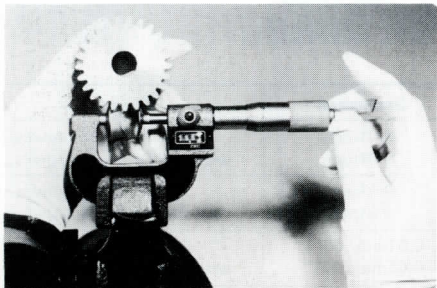
Series 123, Series 223 Disk Type

The thin measuring discs, with .030" edge thickness, enter narrow grooves, slots and recesses, to take measurements on work sections such as ribs, lands, fins; cutting edges on form tools and chordal thickness on gear teeth, as illustrated below

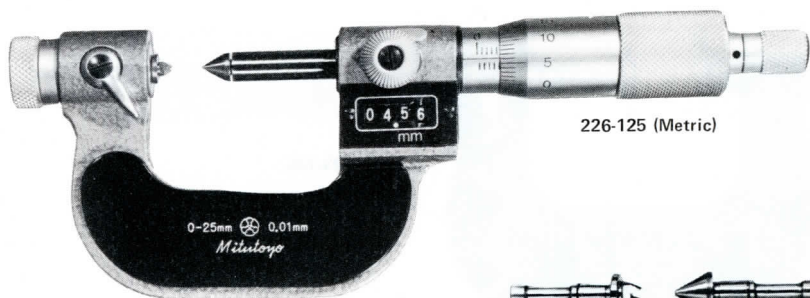
- Accuracy: $\pm .0002''$ up to 2" models
 $\pm .0003''$ up to 4" models
- Measuring discs are hardened, ground and micro-lapped for a greater accuracy.
- Disc flatness: $.00004''$



- Extra-large disc .787" in diameter with .030" edge thickness to enter narrow recesses.
- With all MITUTOYO standard features and quality. With heat-insulating grip cover on the frame.
- Supplied with fitted carrying case.



Range	No.	Graduation
INCH		
0-1"	123-125	.001"
1-2"	123-126	.001" with standard
2-3"	123-127	.001" with standard
3-4"	123-128	.001" with standard
0-1"	223-125	.001" with Digital Counter
METRIC		
0-25mm	123-101	0.01mm
25-50mm	123-102	0.01mm with standard
0-25mm	223-101	0.01mm with Digital Counter



226-125 (Metric)

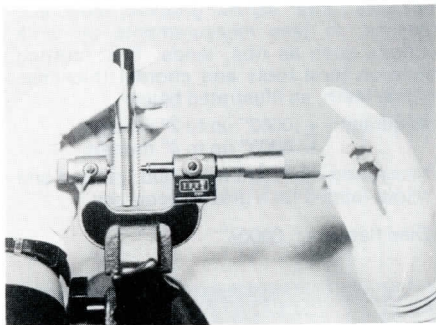
SCREW THREAD MICROMETERS & "COMBIMIKE"

FOR MEASURING PITCH DIAMETER

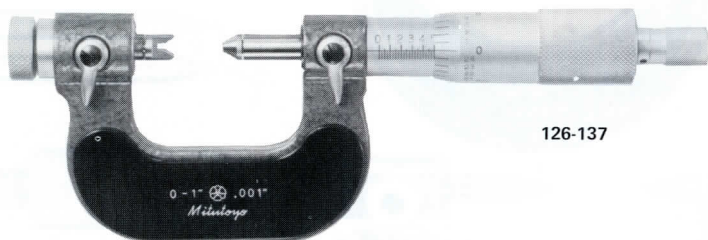
Series 126, Series 226
Interchangeable V-Anvil Type

The screw thread micrometer with interchangeable anvils measures a pitch diameter. Each anvil can be used for both metric and unified external threads. The correct pair of anvils must be selected and inserted in the hollow micrometer spindle and anvil. The micrometer anvil is fully adjustable by the knurled knob located on the anvil side of the frame. Zero set the micrometer with this knob whenever the anvil is interchanged.

	Pitch	No. (Pair)
Individual 60° Metric Anvils	0.4 – 0.5mm	126-801
	0.6 – 0.9mm	126-802
	1.0 – 1.75mm	126-803
	2.0 – 3.0mm	126-804
	3.5 – 5.0mm	126-805
	5.5 – 7.0mm	126-806
Anvil Set	0.4 – 7.0mm	126-800



Type	Range	No.	Graduation	Remarks
Regular	0-25mm	126-125	0.01mm	No Anvils
	25-50mm	126-126	0.01mm	with Standard No Anvils
With Digital Counter	0-25mm	226-125	0.01mm	No Anvils
	25-50mm	226-126	0.01mm	with Standard No Anvils
Combimike	0-25mm/0-1"	226-601	0.01mm/.001"	No Anvils
	25-50mm/1-2"	226-602	0.01mm/.001"	with Standard No Anvils



126-137

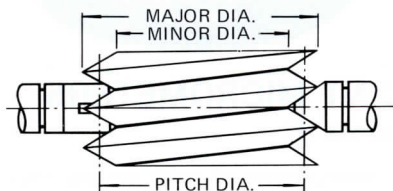
SCREW THREAD MICROMETERS

FOR MEASURING PITCH DIAMETER

Series 126, Series 226

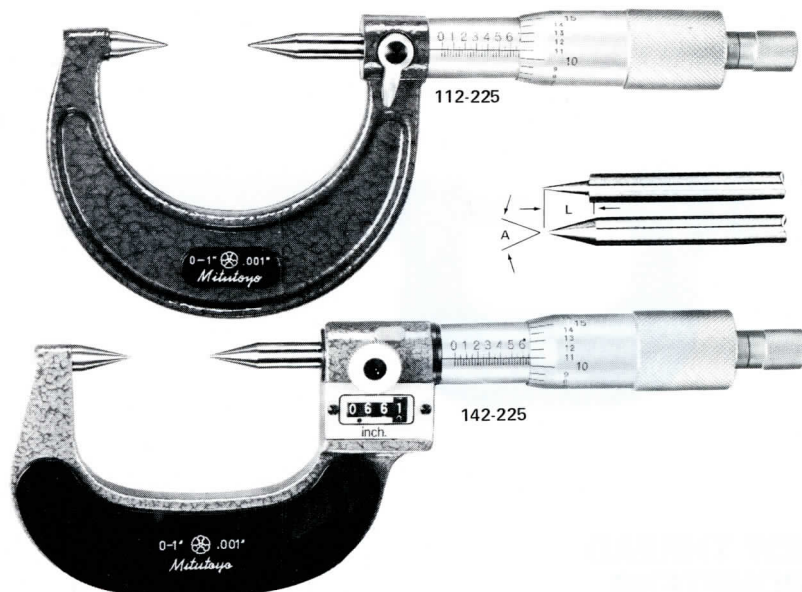
Interchangeable V-Anvil Type

- 60 degree V-Anvil and Conical Spindle are made of high-grade special steel, hardened and precision ground.
- Position of the anvil can be adjusted by the knurled screw located on the anvil side, and securely locked in position.
- Ratchet stop facilitates uniform and consistent measurements.
- Furnished complete with fitted carrying case. The case has indexed holes to store individual anvils.



	Thread per Inch	No.(Pair)
Individual 60° Anvils for Unified Screw Threads	64 – 48 Threads	126-801
	44 – 28 Threads	126-802
	24 – 14 Threads	126-803
	13 – 9 Threads	126-804
	8 – 5 Threads	126-805
	4.5 – 3 Threads	126-806
Anvil Set	64 – 3 Threads	126-800

Range	No.	Graduation	Remarks		Range	No.	Graduation	Remarks	
0-1"	126-137	.001"		No Anvils	0-1"	126-901	.001"		w/Anvil Set
1-2"	126-138	.001"	w/Standard	No Anvils	1-2"	126-902	.001"	w/Standard	w/Anvil Set
2-3"	126-139	.001"	w/Standard	No Anvils	2-3"	126-903	.001"	w/Standard	w/Anvil Set
3-4"	126-140	.001"	w/Standard	No Anvils	3-4"	126-904	.001"	w/Standard	w/Anvil Set
4-5"	126-141	.001"	w/Standard	No Anvils	4-5"	126-905	.001"	w/Standard	w/Anvil Set
5-6"	126-142	.001"	w/Standard	No Anvils	5-6"	126-906	.001"	w/Standard	w/Anvil Set
0-1"	226-137	.001"		No Anvils	WITH DIGITAL COUNTER				
1-2"	226-138	.001"	w/Standard	No Anvils	WITH DIGITAL COUNTER				



POINT MICROMETERS

Series 112, 142

For measurements of small grooves, keyways and other hard-to-reach dimensions. The measuring points have approximately .012" radius, and are available with or without carbide tips.

- Accuracy $\pm .0001$ ".
- Carbide tips increase life of the conical measuring points and improve accuracy.

METRIC

Range	No.	(A)	(L)	Grad.
0-25mm	112-153	15 ⁰	10mm	0.01mm
0-25mm	112-201	30 ⁰	11mm	0.01mm
0-25mm	112-249	45 ⁰	7mm	0.01mm
0-25mm	112-345	60 ⁰	5mm	0.01mm

With DIGITAL COUNTER

0-25mm	142-153	15 ⁰	10mm	0.01mm
0-25mm	142-201	30 ⁰	11mm	0.01mm
0-25mm	142-249	45 ⁰	7mm	0.01mm
0-25mm	142-345	60 ⁰	5mm	0.01mm

INCH

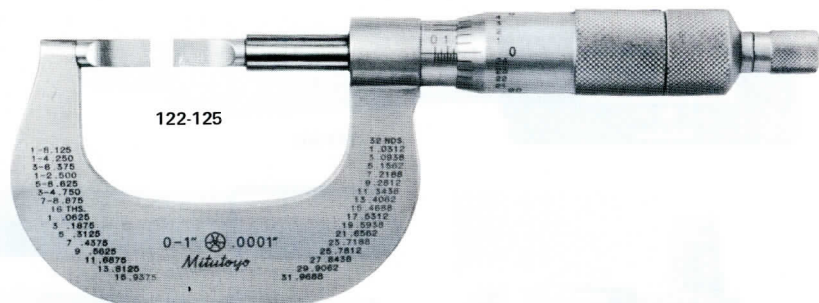
Range	No.	(A)	(L)	Grad.
0 - 1"	112-177	15 ⁰	.394	.001"
0 - 1"	112-225	30 ⁰	.430	.001"
0 - 1"	112-273	45 ⁰	.283	.001"
0 - 1"	112-369	60 ⁰	.204	.001"
1 - 2"	112-178	15 ⁰	.394	.001"
1 - 2"	112-226	30 ⁰	.430	.001"
1 - 2"	112-274	45 ⁰	.283	.001"
1 - 2"	112-370	60 ⁰	.204	.001"
0 - 1"	112-189	15 ⁰	.394	.001"†
0 - 1"	112-237	30 ⁰	.430	.001"†
0 - 1"	112-285	45 ⁰	.283	.001"†
0 - 1"	112-381	60 ⁰	.204	.001"†
1 - 2"	112-190	15 ⁰	.394	.001"†
1 - 2"	112-238	30 ⁰	.430	.001"†
1 - 2"	112-286	45 ⁰	.283	.001"†
1 - 2"	112-382	60 ⁰	.204	.001"†

With DIGITAL COUNTER

0 - 1"	142-177	15 ⁰	.394	.001"
0 - 1"	142-225	30 ⁰	.430	.001"
0 - 1"	142-273	45 ⁰	.283	.001"
0 - 1"	142-369	60 ⁰	.204	.001"

* Without Carbide Measuring Points.

† With Carbide Measuring Points



1-0.125
1-4.250
5-0.375
1-2.500
5-0.625
5-4.750
7-0.875
10.125
5.0625
5.1875
5.3125
7.4375
9.5625
11.6875
13.8125
16.9375

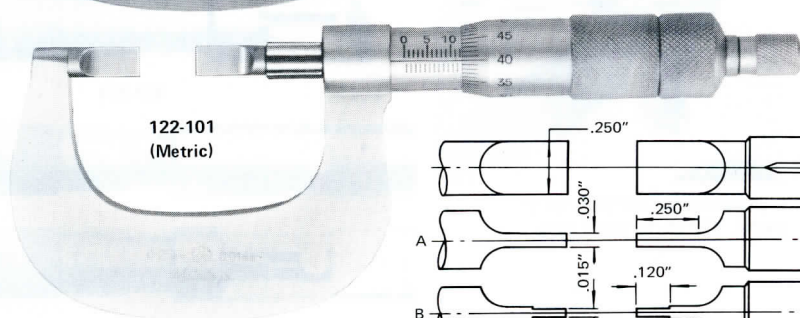
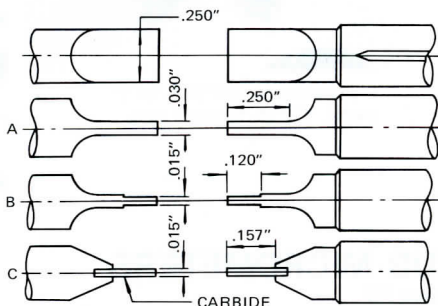
30.000
1.0312
1.0938
5.1562
7.2188
9.2812
11.3438
13.4062
15.4688
17.5312
19.5938
21.6562
23.7188
25.7812
27.8438
29.9062
31.9688

122-125

0-1" $\frac{.0001"}{1}$

Mitutoyo

31.9688

122-101
(Metric)

BLADE MICROMETERS

Non-Rotating Spindle Series 122, 222

- For measurements of narrow grooves, keyways and other hard to reach dimensions.
- Wider variety of blade dimensions... choose the one best suited for your measuring application.
- Decimal equivalent marked on frame. (1" models 122-125, 122-135 and 122-151).
- Hammertone green frame finish on 2", 3" and 4" Models.
- Ratchet stop provides constant measuring pressure.
- Quick zero adjustment on the sleeve.
- Digit Blade Micrometer, one of the indispensable micrometers to measure odd dimensions, is now available exclusively from MITUTOYO with digital counter.
- Supplied with fitted carrying case.

INCH

Range	No.	Graduation	Blade Dimen.
0 - 1"	122-125	.0001"	A
1 - 2"	122-126	.0001"	A
2 - 3"	122-127	.0001"	A
3 - 4"	122-128	.0001"	A
0 - 1"	122-135	.0001"	B
0 - 1"	122-151	.0001"	C
0 - 1"	222-125*	.0001"	A

METRIC

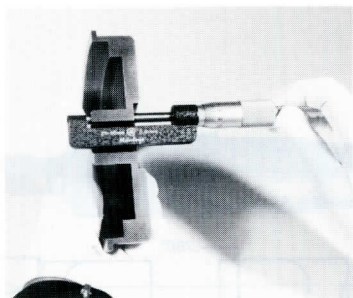
Range	No.	Graduation	Blade Dimen.
0 - 25mm	122-101	0.01mm	A
25 - 50mm	122-102	0.01mm	A
50 - 75mm	122-103	0.01mm	A
75 - 100mm	122-104	0.01mm	A

* With Digital Counter

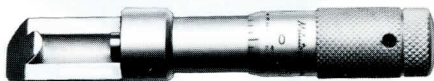
Standard furnished over 1"(25mm) range.



147-351



Frame clearance 3/4" DIA. for 1" model, 1" DIA. for larger sizes.



147-201



147-104

HUB MICROMETERS

Series 147

The new Hub Micrometer incorporates extra shallow, specially designed frame to clear through 3/4" dia. hole (1" Model).

New micrometer is designed for hub length measurements, but can be used in other areas where regular C-shaped micrometer cannot be applied.

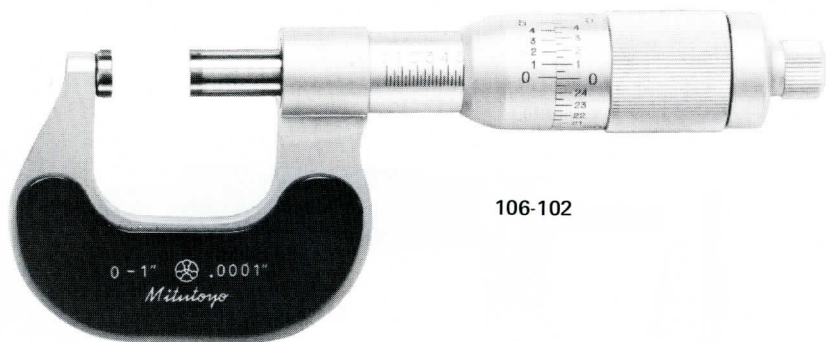
Four models, from 0-1" to 3-4", are now available from MITUTOYO. All of them are equipped with carbide measuring faces, ratchet stop, satin chromed sleeve and thimble and supplied with fitted carrying case. The smallest reading is .001".

CAM SEAM MICROMETERS Series 147

The can seam micrometer is primarily designed for can manufacturing industry. It measures the width and depth of welded can seams to .001"

- Satin chrome throughout.
- Adjustable zero point (by loosening a hex nut on the thimble).
- 147-104 has .200" depth measuring range.
- Anvil and spindle are hardened and precision ground. With micro-lap finish on the measuring face.
- Supplied with a hexagon wrench for zero re-adjustment.

Range	No.	Grad.	Frame Clearance	Range	No.	Graduation
0 - 1"	147-351	.001"	3/4" dia.	0-.500"	147-104	.001" with Depth Rod
1 - 2"	147-352	.001"	1" dia.	0-.500"	147-106	.001"
2 - 3"	147-353	.001"	1" dia.	0-.500"	147-201	.001"
3 - 4"	147-354	.001"	1" dia.			

**106-102**

"MICRON" OUTSIDE MICROMETERS

Series 106, Series 206

Non-Rotating Spindle—Flush Reading

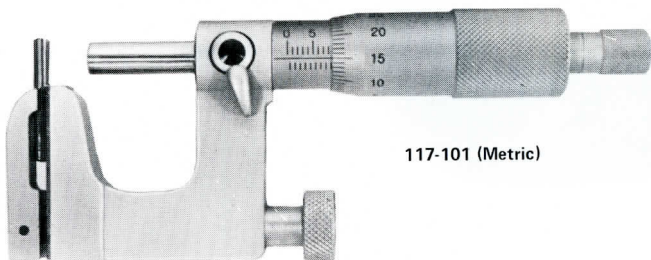
All MITUTOYO Micrometers meet or exceed Federal Specifications for accuracy.

Unlike regular Micrometers with .250" diameter spindle, the "Micron" Micrometer incorporates a larger .315" diameter spindle which does not rotate throughout its entire 1" range. Because of this Non-Rotating spindle, the "Micron" Micrometer is highly recommended for measurements of fragile materials, polished work, coated plates and other finished products.

It also features a Flush Reading thimble, which eliminates parallax reading errors. The "Micron" Micrometer is also available with a Digital Counter.

- Flatness .000030".
- Parallelism to .000050".
- Accuracy .0001".
- .315" diameter measuring faces.
- No torsion on work surface because of Non-Rotating spindle.
- Carbide faced Spindle and Anvil, with micro-lapped measuring faces.
- Friction thimble and speeder for exact and repetitive measurements.
- Clear graduations on satin chrome finished thimble and sleeve. Glare-free readings.
- Quick and easy zero adjustment with furnished wrench.
- Every thousandth is numbered for easy reading.
- Complete with fitted carrying case.

	Range	No.	Graduation	Description
INCH	0 - 1"	106-102	.0001"	Non-Rotating Spindle
	1 - 2"	106-104	.0001"	Non-Rotating Spindle with Standard
	0 - 1"	206-102	.0001"	Non-Rotating Spindle with Digital Counter
METRIC	0 - 25mm	106-101	.001mm	Non-Rotating Spindle



117-101 (Metric)

UNI-MIKE^{T.M.} Series 117, 217

The MITUTOYO Uni-Mike has a vise-like special frame which is designed to hold interchangeable anvils. Two anvils, Flat (201216) and Rod (201217), are supplied with the Uni-Mike, and three other anvils are available to facilitate special measurements.

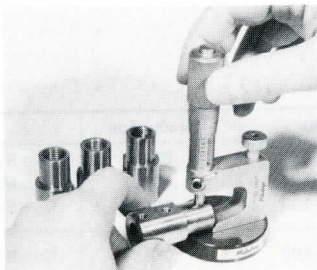
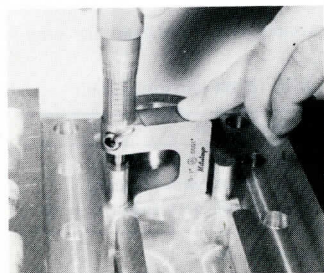
The Uni-Mike is also used without anvil to measure step or height as illustrated below. The bottom surface of the frame is precision ground to provide a reference plane in step measurements.

Among the supplied anvils, the Rod Anvil with its .118" (3mm) diameter is useful in checking small tube thicknesses or checking the distance between a drilled hole to the edge of the work-

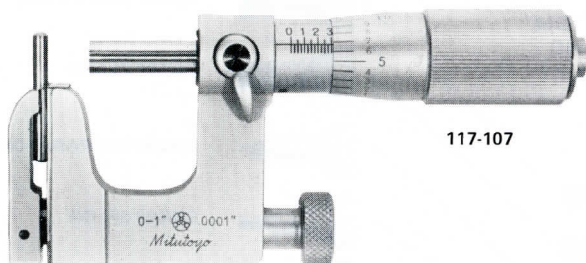
piece. The Flat Anvil is .059" (1.5mm) in thickness, and is used to measure shoulders, lands, fins, etc. as well as regular outside dimensions.

The optional Disc Anvils (940758 and 950759) are used as a base to measure outside dimensions. They are lapped and have a mirror surface for greater accuracy. Special connecting rod is supplied with the Disc Anvils. Another optional anvil, the V-Anvil (201218) is for measuring the head thickness of screws and the like, and has a 120 degree Vee on one end.

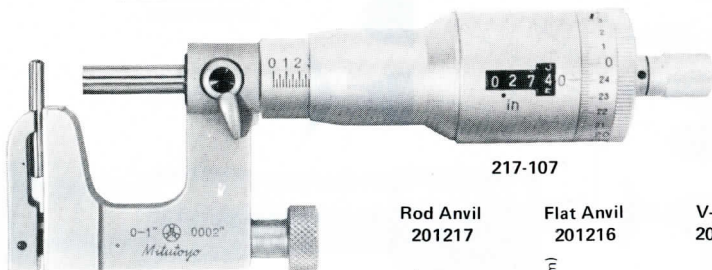
The same anvils can be used for both inch and metric models.



1. Without anvil and clamp, the Uni-Mike can measure heights or steps to .0001" accuracy.
2. With special Disc Anvil (950758 is shown in photo), the Uni-Mike is used as a height micrometer. The disc has a lapped, mirror surface.



117-107



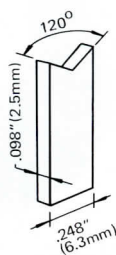
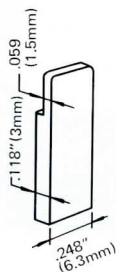
217-107

Rod Anvil
201217Flat Anvil
201216V-Anvil
201218

UNI-MIKE^{T.M.} Series 117 and 217

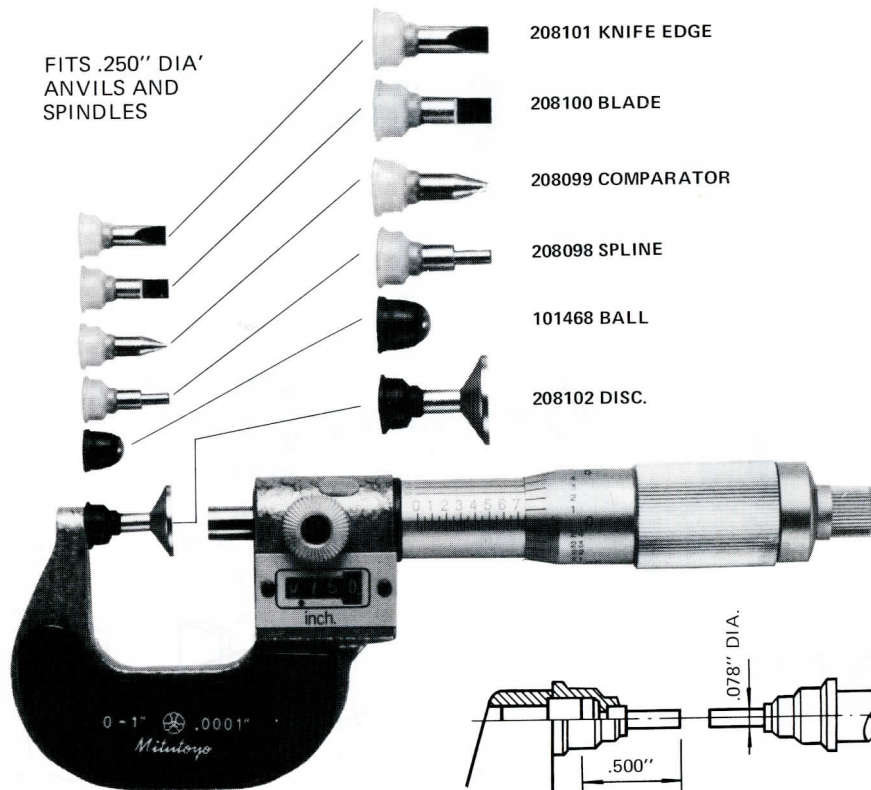
Interchangeable Anvil Type

- Two interchangeable anvil - Flat Anvil (No. 201216) and Rod Anvil (No. 201217) - are furnished.
- Measures hard-to-reach locations, such as from a hole or slot to an edge, Small tube wall thickness, shoulder to an edge, etc.
- Carbide tipped spindle face.
- Extra-wide frame for more accuracy.
- Complete with fitted carrying case.

Disc Anvil for
1" (25mm)
950758Disc Anvil for
2" (50mm)
950759

	Range	No.	Graduation	Remarks	
Inch	0-1"	117-107	.0001"	Flat and Rod Anvils	
	1-2"	117-108	.0001"	Flat and Rod Anvils	with Standard
	0-1"	217-107	.0002"	Flat and Rod Anvils	with Digital Counter
	1-2"	217-108	.0002"	Flat and Rod Anvils	with Standard with Digital Counter
Metric	0-25mm	117-101	0.01mm	Flat and Rod Anvils	
	25-50mm	117-102	0.01mm	Flat and Rod Anvils	with Standard
	0-25mm	217-101	0.01mm	Flat and Rod Anvils	
					with Digital Counter

FITS .250" DIA'
ANVILS AND
SPINDLES



ANVIL ATTACHMENTS FOR OUTSIDE MICROMETERS

To measure odd workpieces, several convenient anvil attachments are prepared by MITUTOYO. Among them the most often used one is the ball attachment part No. 101468.

The ball attachment is a hardened steel ball with .200" diameter which is placed on the anvil by a rubber cap.

With this attachment, a regular micrometer can measure cylindrical wall thickness. .200" must be subtracted from the reading.

Other attachments shown here are .500" in

length. The added amount must be subtracted from the reading.

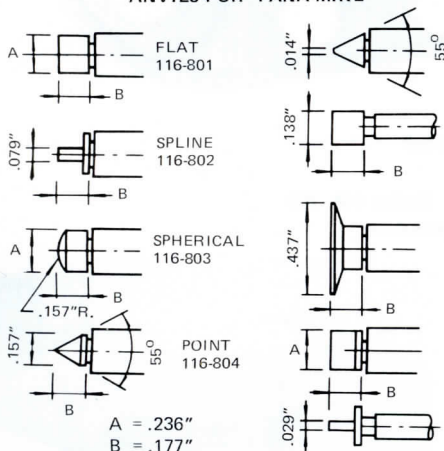
As the above illustration indicates, a pair of attachments can be applied to 2" micrometers to measure 0-1" range.

Part No.	Description	Dimension
101468	Ball attachment	.200" dia.
208098	Spline type	.078" dia.
208099	Comparator type	.039" tip x 30°
208100	Blade type	.029" thickness
208101	Knife Edge type	.019" face x 30°
208102	Disc type	.500" dia.



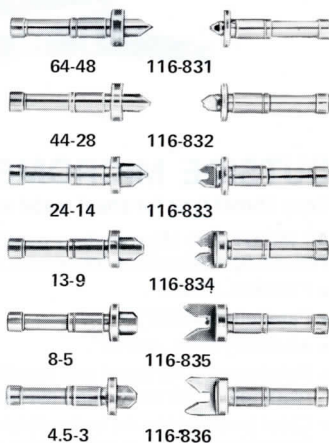
116-105

INTERCHANGEABLE MULTI ANVILS FOR "PANA-MIKE"



Complete Set No. 116-800

INTERCHANGEABLE SCREW THREAD ANVILS FOR "PANA-MIKE"



Complete Set No. 116-830

PANA-MIKE® Series 116

Outside Micrometer with Non-Rotating Spindle, Interchangeable Type

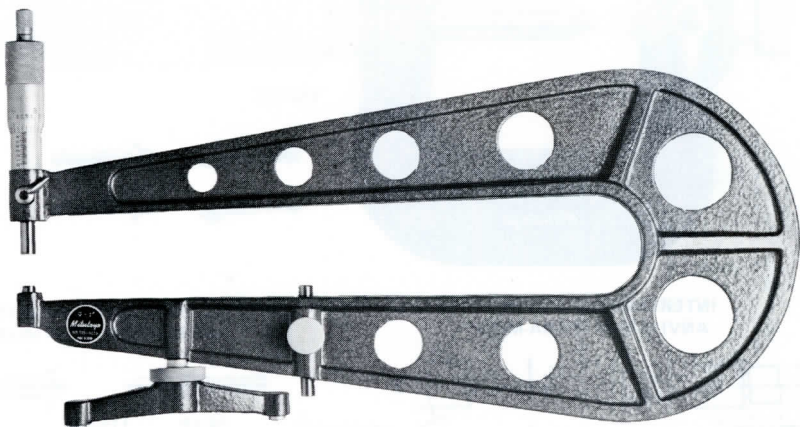
The Pana-Mike accepts 13 pairs of individual anvils and makes it possible to gage various odd dimensions usually unattainable by a single micrometer. Anvils are available individually or in sets. The carrying case for the Pana-Mike comes with an indexed plate where all anvils can be neatly stored.

The Pana-Mike does the job of several different micrometers, and is a rugged satin chromed finish, non-rotating spindle micrometer.

- Non-rotating spindle, with ratchet stop.
- 13 pairs of individual anvils for precise gaging. Also available in sets.
- Complete with fitted carrying case. Index plate provided for anvil storage.

Range	No.	Graduation
0-1"	116-105	.001"
1-2"	116-106	.001" with standard

Pana-Mikes are sold without anvils.



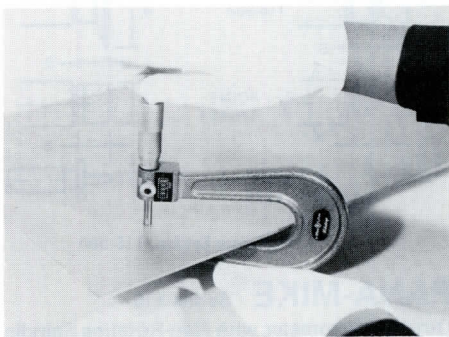
118-107

OUTSIDE MICROMETERS Series 118, 189

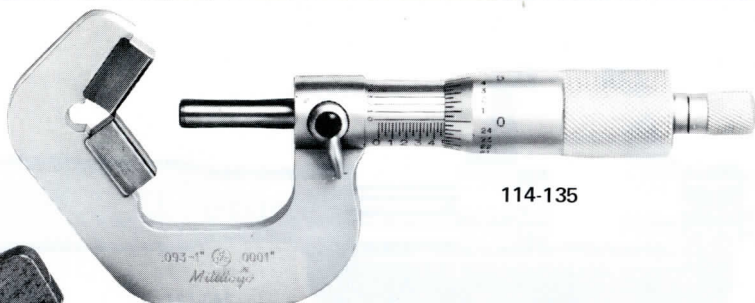
Deep Throat type for sheet metal and similar operations

All MITUTOYO Micrometers meet or exceed Federal Specifications for accuracy.

- Flatness .00003".
- Parallelism .0001".
- Accuracy from .00015".
- Ratchet stop for exact and repetitive readings. Positive locking clamp.
- Clear graduations on satin-chrome finish. Every thousandth numbered for easy reading.
- Anvil and spindle hardened and precision ground. Micro-lap finish on carbide measuring faces.
- Hammertone—green, baked-enamel finished frame.
- No. 118-107 has height-adjustable, work-piece-support and frame stand for quick and stable measuring.
- Complete with fitted carrying case.



Range	No.	Graduation	Depth of Throat
0 - 1"	118-129	.0001"	6"
0 - 1"	118-107	.001"	12"
0 - 1"	189-129	.0001"	6" with Digital Counter



114-135



214-202

V-ANVIL MICROMETERS

Series 114, 214

3 Flutes and 5 Flutes

.093" to 1" with Carbide Faces

The V-Anvil Micrometer is used for the measurements of 3 or 5 flutes cutting heads, such as 3 or 5 flutes end mills, of-fluted taps, reamers and the like. The 3 flutes V-Anvil Micrometer is particularly suited for measuring parts ground by the centerless grinder to check out-of-roundness.

- Flatness .000040".
- Overall accuracy .00015".
- Graduations .0001".
- With or without digital counter.

- Measuring faces, spindle tip and V-Anvil, are carbide faced for lasting accuracy.
- Positive locking clamp with ratchet stop.
- 114-202 and 135 with satin chromed frame. 214-202 with hammertone finish.
- Direct reading of outside diameters of 3 and 5 fluted cutting tools.
- Ideal for checking out-of-roundness in centerless grinding.
- Satin chromed sleeve and thimble for glare-free readings.
- Complete with fitted carrying case.

Range	No.	No. of Flutes	Standard	Grad.	Description
.093 - 1"	114-202	3	with standard	.0001"	with Digital Counter 0.001"
.093 - 1"	114-135	5	with standard	.0001"	
.093 - 1"	214-202	3	with standard	.0001"	



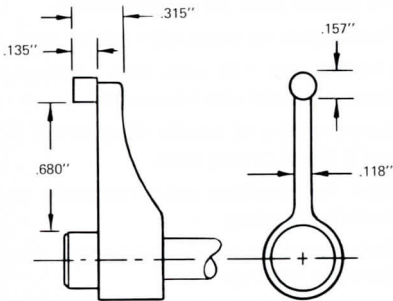
143-121

OUTSIDE MICROMETERS

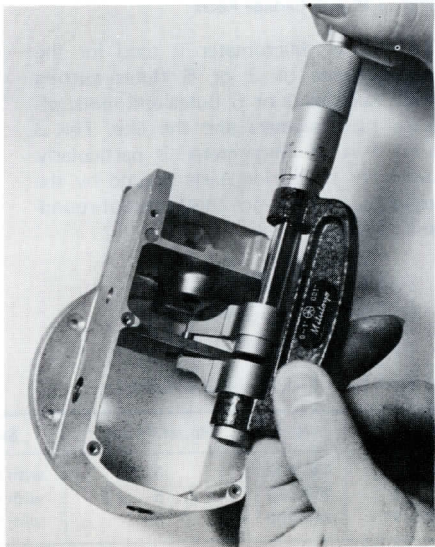
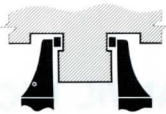
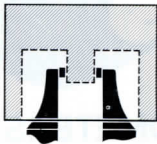
Series 143 Caliper Type

The Caliper Type Micrometer is used for special measuring requirements where the dimension to be inspected is inaccessible to a regular micrometer. The measuring anvils are approximately 3/4" above the micrometer and carbide faced for long-lasting accuracy. Diameter of the anvil is .157" (see drawing below for other dimensions).

DIMENSIONS



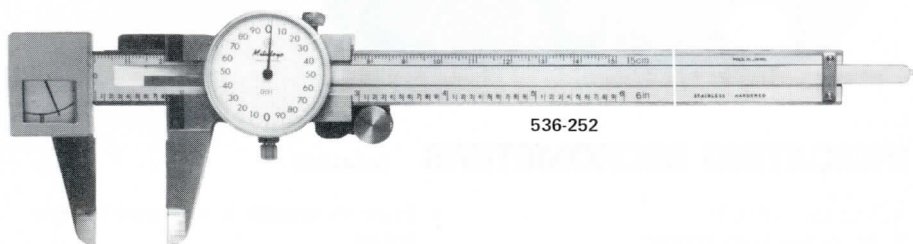
Application Examples



Range	No.	Grad.	Remarks
0-1"	143-121	.001"	
1-2"	143-122	.001"	w/Standard



227-111



536-252

LOW PRESSURE MICROMETERS Series 227

LOW PRESSURE DIAL CALIPERS Series 536

Both instruments shown here are specially designed for plastic industry where suitable hand held measuring tools are not easily available. Standard measuring tools are made for metalworking purposes, and they deform the resilient test pieces because of their relatively high contact pressure. Optical comparators are often used for close dimensional examination, but they are not always recommended since some materials are of light-absorbing type producing a very poor image on the screen. Or, in the case of rubber products, testpieces are made of non-reflective black rubber, simply making it impossible to observe through a comparator.

One direction to solve the problem is to reduce the measuring contact pressure. Standard micrometers generate up to 1000 grams when a friction or ratchet stop is used for constant measurements.

MITUTOYO's low pressure micrometer and dial caliper reduce the pressure almost by one tenth. The contact pressure of the special micrometer shown here is about 100 grams. The dial caliper from 50 to 100 grams. Both instruments are designed with a parallel leaf spring to yield excess measuring pressure. The readings are taken only when the spring indicator shows zero position.

	Range	No.	Graduation	Contact Pressure
MICROMETER	0 - 1"	227-111	.0001"	Approx. 100 gf
	0 - 25mm	227-101	0.01mm	Approx. 100 gf
DIAL CALIPER	0 - 8"	536-252	.001"	Approx. 50 - 100 gf
	0 - 200mm	536-251	0.01mm	Approx. 50 - 100 gf



510-106

INDICATING MICROMETERS Series 510

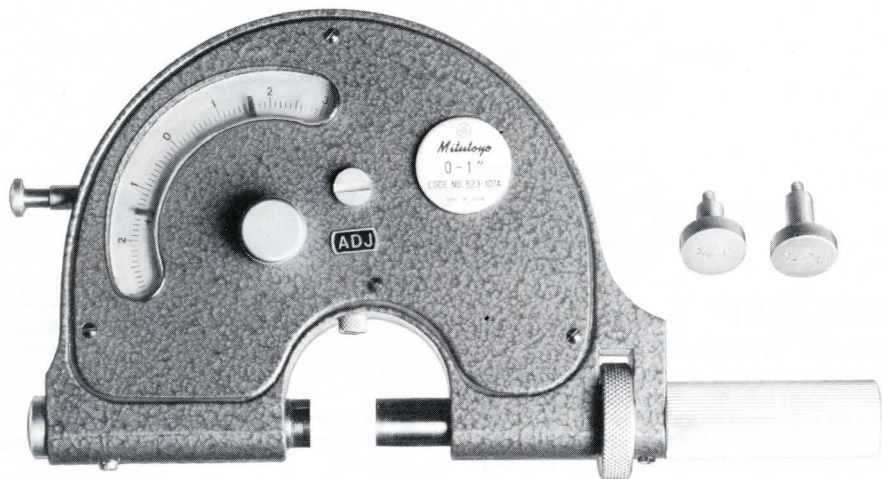
- Flatness .000012".
- Parallelism from .00005".
- Indicating accuracy to .00008".
- Minimum dial reading .0001".
- Carbide faces.
- Jeweled bearings.
- Has vernier scale on barrel.
- Spindle diameter .315".
- Anvil and spindle hardened and precision ground — with micro-lap finish on measuring faces.
- Spindle clamp ring.
- Indicating range $\pm .001$ ".
- Clear graduations on satin chrome finish.
- Every thousandth is numbered for easy setting.
- All parts subject to wear fully hardened.
- Retracting button convenient to operator's thumb.
- Tolerance hands can be set as desired.
- Wider graduation for easy reading.
- Quick and easy zero adjustment.
- Tool operates as a go/no-go gage and as a limited run, sensitive, indicating micrometer.
- Hammertone green baked—enamel—finished frame.
- Complete with fitted carrying case.

Inch

Range	No.	Graduation of Head	Graduation of Indicator	Range of Indicator
0 - 1"	510-105	.0001"	.0001"	$\pm .001$ "
1 - 2"	510-106	.0001"	.0001"	$\pm .001$ " with standard
2 - 3"	510-107	.0001"	.0001"	$\pm .001$ " with standard
3 - 4"	510-108	.0001"	.0001"	$\pm .001$ " with standard

Metric

0 - 25mm	510-101	0.001mm	0.001mm	$\pm .02$ mm
25 - 50mm	510-102	0.001mm	0.001mm	$\pm .02$ mm with standard



523-107

DIAL SNAP METERS Series 523

HIGH ACCURACY (80 MILLIONTHS) GO/NO-GO GAGE

The Mitutoyo Dial Snap Meter is a highly sophisticated and accurate Go/No-Go Gage, and is commonly used in segregating production parts, or detecting over or under sized work pieces. The gage consists of a retractable anvil connected to the indicating hand, and 1" adjustable rigid spindle.

The heavy duty anvil and spindle are approximately .420" in diameter, and are carbide faced to withstand repetitive measurements. The parallelism between the measuring faces is 30 millionths or less.

Master piece or gage block is required to set zero-point.

- Flatness of the face is well within one band of ray when observed with an optical flat.

- Indicating range $\pm .003''$; smallest graduation on the dial .0001".
- Tolerance hands can be quickly adjusted by dismounting the protective cap and selecting the hand position specified.
- Two work stoppers furnished.
- Rugged overall construction to withstand excessive use in the shop.
- .420" diameter anvil and spindle carbide faced for repetitive measurements.
- Hammertone green baked-enamel finish.
- Complete with fitted carrying case.

	Range	No.	Graduation & Remarks
INCH	0 - 1"	523-107	.0001" with Two Work Stoppers
	1 - 2"	523-108	.0001" with Two Work Stoppers
METRIC	0 - 25mm	523-101	0.002mm with Two Work Stoppers



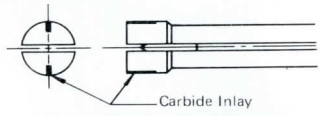
368-021



368-026

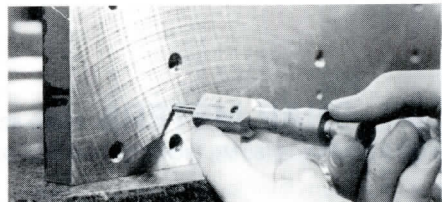
“HOLTEST” Series 368
Range .080” (2mm) to .280” (6mm)

Unlike other Holtests, the Holtests designed to measure small hole ID’s, shown on this page, are two-point ID micrometers. They are for inside diameters as small as .080” (2mm) and they provide a reading capability of .0001” (0.001mm).



- Measure and read like a depth micrometer.
- With ratchet stop for consistent measuring pressure.

To read ID’s to .0001” directly, the probe movement is designed to assure consistent accuracy over the entire range. The new probe movement, designed by MITUTOYO, fixes one side of the probe and allows the other half of the probe to move parallel to the stationary side. With this new design, and the sophisticated leaf-spring mechanism it employs, these Holtests are by far the most direct and accurate instruments to check small hole diameters.



Checking small hole ID’s with a Holtest. Two-point contact Holtests read to .0001” directly on the thimble.

Inch

Metric

Set No.	Range	Individual No.	Graduation	Set No.	Range	Individual No.	Graduation
368-926*	.080 - .100"	368-021	.0001"	368-906 ⁺	2 - 2.5mm	368-001	0.001mm
	.100 - .120"	368-022	.0001"		2.5 - 3mm	368-002	0.001mm
368-927**	.120 - .160"	368-023	.0001"	368-907 ⁺⁺	3 - 4mm	368-003	0.001mm
	.160 - .200"	368-024	.0001"		4 - 5mm	368-004	0.001mm
	.200 - .240"	368-025	.0001"		5 - 6mm	368-005	0.001mm
	.240 - .280"	368-026	.0001"				

* Set No. 368-926 includes: Ring Gage .100"DIA. 177-209 and Hex. Wrench 202863.
** Set No. 368-927 includes: Ring Gage .160"DIA. 177-206, Ring Gage .240"DIA. 177-207 and Hex Wrench 202863.
⁺ Set No. 368-906 includes: Ring Gage 2.5mmDIA. 177-208 and Hex Wrench 202863.
⁺⁺ Set No. 368-907 includes: Ring Gage 4mmDIA. 177-204, Ring Gage 5mmDIA. 177-205 and Hex Wrench 202863.



368-201



368-203

"HOLTEST" Series 368, Range .275" (6mm) to .500" (12mm)

While the smallest "Holtest" group, described on the preceding page, features a two-point contact; the "Holtests" on this page have the three measuring anvils which are one of the basic features of the "Holtest" Series 368.

The "Holtests", shown here, feature three carbide anvils for long-lasting tool life. These anvils make line contact against the internal wall surface.

The smallest reading on the thimble is .0001" with vernier. "Holtests", with digital counters, provide .001" readings, a welcomed feature since all "Holtests" read in reverse order.

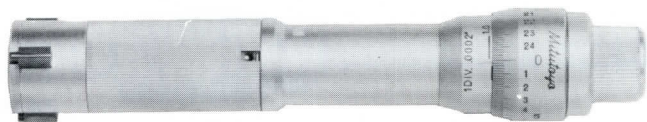
Available individually and in sets. Satin-chrome finish throughout.



Application Example

Bores for valves are checked by a "Holtest", No. 368-403, which features digital readout to .001", and reads to .0001" by thimble.

Range	Individual No.	Graduation		Set No.	Accessories included in set
		Thimble	Counter		
INCH					
With Carbide					
.275 — .350"	368-201	.0001"		368-921	Ring Gage .350"DIA. 177-179
.350 — .425"	368-202	.0001"			Ring Gage .500"DIA. 177-180
.425 — .500"	368-203	.0001"			Extension Rod 4" 952322
With Carbide and Digital Counter					
.275 — .350"	368-401	.0001"	.001"	368-941	Spanners (pair) 205289
.350 — .425"	368-402	.0001"	.001"		Hex. Wrench 202863
.425 — .500"	368-403	.0001"	.001"		
METRIC					
With Carbide					
6 — 8mm	368-101	0.001mm		368-901	Ring Gage 8mmDIA. 177-125
8 — 10mm	368-102	0.001mm			Ring Gage 10mmDIA. 177-126
10 — 12mm	368-103	0.001mm			Extension Rod 100mm 952322
With Carbide and Digital Counter					
6 — 8mm	368-301	0.001mm	0.01mm	368-931	Spanners (pair) 205289
8 — 10mm	368-302	0.001mm	0.01mm		Hex. Wrench 202863
10 — 12mm	368-303	0.001mm	0.01mm		



368-206



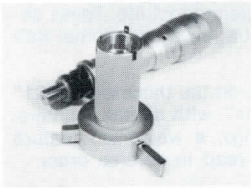
368-209

“HOLTEST” Series 368 Interchangeable Anvils

The range of .500” to 2.000” is the most frequently encountered ID range in bore gaging. The MITUTOYO Holtests covering this range offer several choices to meet various measuring needs.

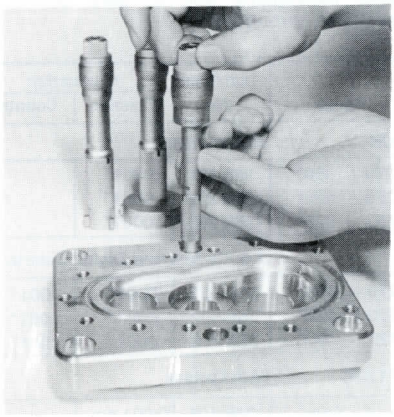
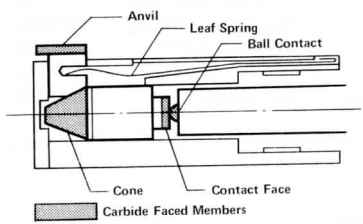
1. Available with carbide, as illustrated below, or without carbide.
2. The Holtests covering this range are featured with interchangeable anvils, whether they are with carbide or without.
3. Optional special anvils increase the area of Holtest application into such dimensions as internal grooves, splines, serrations, etc.
4. Extension rod can be adapted to reach deeper holes.

Interchangeable Anvils

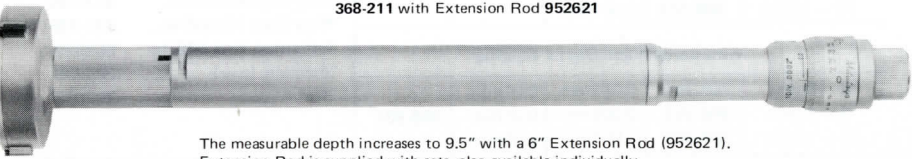


To interchange furnished standard anvils with optional special ones, disconnect Holtest and pull out three leaf springs which hold anvils against cone.

INTERNAL CONSTRUCTION



368-211 with Extension Rod 952621



The measurable depth increases to 9.5” with a 6” Extension Rod (952621). Extension Rod is supplied with sets, also available individually.

**“HOLTEST”** Series 368, Range .500 – 2”, Interchangeable Anvil Type

Type	Range	Individual No.	Graduation		Set No.	Accessories included in set
			Thimble	Counter		
Plain Finish	.500 – .650” .650 – .800”	368-804 368-805	.0002” .0002”		368-982	Ring Gage .650”DIA. 177-182
With Carbide	.500 – .650” .650 – .800”	368-204 368-205	.0002” .0002”		368-922	Extension Rod 6” Spanners (pair) 952621 205312
With Carbide and Digital Counter	.500 – .650” .650 – .800”	368-404 368-405	.0002” .0002”	.001” .001”	368-942	Hex. wrench 202863
Plain Finish	.800 – 1.000” 1.000 – 1.200” 1.200 – 1.400” 1.400 – 1.600” 1.600 – 1.800” 1.800 – 2.000”	368-806 368-807 368-808 368-809 368-810 368-811	.0002” .0002” .0002” .0002” .0002” .0002”		368-983	
With Carbide	.800 – 1.000” 1.000 – 1.200” 1.200 – 1.400” 1.400 – 1.600” 1.600 – 1.800” 1.800 – 2.000”	368-206 368-207 368-208 368-209 368-210 368-211	.0002” .0002” .0002” .0002” .0002” .0002”		368-923	Ring Gage 1.000”DIA. 177-184 Ring Gage 1.400”DIA. 177-185 Ring Gage 1.800”DIA. 177-186 Extension Rod 6” 952622 Spanners (pair) 205331 Hex. wrench 202863
With Carbide and Digital Counter	.800 – 1.000” 1.000 – 1.200” 1.200 – 1.400” 1.400 – 1.600” 1.600 – 1.800” 1.800 – 2.000”	368-406 368-407 368-408 368-409 368-410 368-411	.0002” .0002” .0002” .0002” .0002” .0002”	.001” .001” .001” .001” .001” .001”	368-943	

“HOLTEST” Series 368, Range 12 – 50mm, Interchangeable Anvil Type

Plain Finish	12 – 16mm 16 – 20mm	368-704 368-705	0.005mm 0.005mm		368-972	Ring Gage 16mmDIA. 177-177
With Carbide	12 – 16mm 16 – 20mm	368-104 368-105	0.005mm 0.005mm		368-902	Extension Rod 150mm Spanners(pair) 952621 205312
With Carbide and Digital Counter	12 – 16mm 16 – 20mm	368-304 368-305	0.005mm 0.005mm	0.01mm 0.01mm	368-932	Hex. wrench 202863
Plain Finish	20 – 25mm 25 – 30mm 30 – 35mm 35 – 40mm 40 – 45mm 45 – 50mm	368-706 368-707 368-708 368-709 368-710 368-711	0.005mm 0.005mm 0.005mm 0.005mm 0.005mm 0.005mm		368-973	
With Carbide	20 – 25mm 25 – 30mm 30 – 35mm 35 – 40mm 40 – 45mm 45 – 50mm	368-106 368-107 368-108 368-109 368-110 368-111	0.005mm 0.005mm 0.005mm 0.005mm 0.005mm 0.005mm		368-903	Ring Gage 25mmDIA. 177-139 Ring Gage 35mmDIA. 177-140 Ring Gage 45mmDIA. 177-178 Extension Rod 150mm Spanners (pair) 952622 205331 Hex. wrench 202863
With Carbide and Digital Counter	20 – 25mm 25 – 30mm 30 – 35mm 35 – 40mm 40 – 45mm 45 – 50mm	368-306 368-307 368-308 368-309 368-310 368-311	0.005mm 0.005mm 0.005mm 0.005mm 0.005mm 0.005mm	0.01mm 0.01mm 0.01mm 0.01mm 0.01mm 0.01mm	368-933	

For optional interchangeable anvils, see following pages.



368-418
With Carbide
and Digital
Counter

368-219
With Carbide

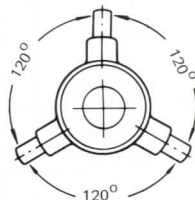
368-817
Plain Finish

“HOLTEST” Series 368,

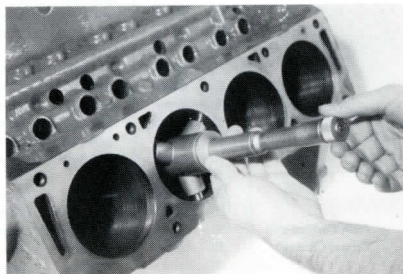
Range 2-12” (50-300mm)

The MITUTOYO “Holtests”, covering 2-12” (50-300mm) range, offer four selections as follows:

1. “Holtests” without carbide or plain finish, which means no carbide on anvils or on cone. No. 368-817 photo, shown here represent this group.
2. “Holtests” with carbide, as illustrated on the preceding page. No. 368-219 shown here, is of this product group.
3. “Holtests” with carbide and digital counter. No. 368-418 represent this group.
4. With or without carbide, the above three groups have fixed anvils which cannot be removed. The fourth group of “Holtests”, covering 2.200 - 12.200” range, feature interchangeable anvils. See following pages for more information.



Application Example



**"HOLTEST"** Series 368, Range 2 – 12", Fixed Anvil Type

Type	Range	Individual No.	Graduation		Set No.	Accessories included in set
			Thimble	Counter		
Plain Finish	2.0 – 2.4"	368-812	.0002"		368-984	
	2.4 – 2.8"	368-813	.0002"			
	2.8 – 3.2"	368-814	.0002"			
	3.2 – 3.6"	368-815	.0002"			
	3.6 – 4.0"	368-816	.0002"			
With Carbide	2.0 – 2.4"	368-212	.0002"		368-924	Ring Gage 2"DIA. 177-187
	2.4 – 2.8"	368-213	.0002"			Ring Gage 2.8"DIA. 177-188
	2.8 – 3.2"	368-214	.0002"			Ring Gage 3.6"DIA. 177-189
	3.2 – 3.6"	368-215	.0002"			Extension Rod 6" 952623
	3.6 – 4.0"	368-216	.0002"			Spanners (pair) 205348
With Carbide and Digital Counter	2.0 – 2.4"	368-412	.0002"	.001"	368-944	Hex. Wrench 202863
	2.4 – 2.8"	368-413	.0002"	.001"		
	2.8 – 3.2"	368-414	.0002"	.001"		
	3.2 – 3.6"	368-415	.0002"	.001"		
	3.6 – 4.0"	368-416	.0002"	.001"		
Plain Finish	4 – 5"	368-817	.0002"		368-985	
	5 – 6"	368-818	.0002"			
	6 – 7"	368-819	.0002"			
	7 – 8"	368-820	.0002"			
With Carbide	4 – 5"	368-217	.0002"		368-925	Set Frame 5", 7"DIA. 177-200
	5 – 6"	368-218	.0002"			Extension Rod 6" 952623
	6 – 7"	368-219	.0002"			Spanners (pair) 205348
	7 – 8"	368-220	.0002"			Hex. Wrench 202863
With Carbide and Digital Counter	4 – 5"	368-417	.0002"	.001"	368-945	
	5 – 6"	368-418	.0002"	.001"		
	6 – 7"	368-419	.0002"	.001"		
	7 – 8"	368-420	.0002"	.001"		
Plain Finish	8 – 9"	368-821	.0002"			
	9 – 10"	368-822	.0002"			
	10 – 11"	368-823	.0002"			
	11 – 12"	368-824	.0002"			
With Carbide	8 – 9"	368-221	.0002"			
	9 – 10"	368-222	.0002"			
	10 – 11"	368-223	.0002"			
	11 – 12"	368-224	.0002"			
With Carbide and Digital Counter	8 – 9"	368-421	.0002"	.001"		
	9 – 10"	368-422	.0002"	.001"		
	10 – 11"	368-423	.0002"	.001"		
	11 – 12"	368-424	.0002"	.001"		

Note 1: "Holtest" sets are not available over 8" range. Choose individual sizes and Set Frames described in the following pages.

Note 2: Items shown above are of fixed anvil type, for interchangeable anvils, see page 59.



“HOLTEST” Series 368, Range 50 – 300mm, Fixed Anvil Type

Range		Individual No.	Graduation		Set No.	Accessories included in Set
			Thimble	Counter		
Plain Finish	50-60mm	368-712	0.005mm		368-974	Ring Gage 50mm DIA. 177-146 Ring Gage 70mm DIA. 177-147 Ring Gage 90mm DIA. 177-148 Extension Rod 150mm 952623 Spanners (pair) 205348 Hex. Wrench 202863 202863
	60-70mm	368-713	0.005mm			
	70-80mm	368-714	0.005mm			
	80-90mm	368-715	0.005mm			
	90-100mm	368-716	0.005mm			
With Carbide	50-60mm	368-112	0.005mm		368-904	
	60-70mm	368-113	0.005mm			
	70-80mm	368-114	0.005mm			
	80-90mm	368-115	0.005mm			
	90-100mm	368-116	0.005mm			
With Carbide and Digital Counter	50-60mm	368-312	0.005mm	0.01mm	368-934	
	60-70mm	368-313	0.005mm	0.01mm		
	70-80mm	368-314	0.005mm	0.01mm		
	80-90mm	368-315	0.005mm	0.01mm		
	90-100mm	368-316	0.005mm	0.01mm		
Plain Finish	100-125mm	368-717	0.005mm		368-975	
	125-150mm	368-718	0.005mm			
	150-175mm	368-719	0.005mm			
	175-200mm	368-720	0.005mm			
With Carbide	100-125mm	368-117	0.005mm		368-905	
	125-150mm	368-118	0.005mm			
	150-175mm	368-119	0.005mm			
	175-200mm	368-120	0.005mm			
With Carbide and Digital Counter	100-125mm	368-317	0.005mm	0.01mm	368-935	
	125-150mm	368-318	0.005mm	0.01mm		
	150-175mm	368-319	0.005mm	0.01mm		
	175-200mm	368-320	0.005mm	0.01mm		
Plain Finish	200-225mm	368-721	0.005mm			
	225-250mm	368-722	0.005mm			
	250-275mm	368-723	0.005mm			
	275-300mm	368-724	0.005mm			
With Carbide and	200-225mm	368-121	0.005mm			
	225-250mm	368-122	0.005mm			
	250-275mm	368-123	0.005mm			
	275-300mm	368-124	0.005mm			
With Carbide and Digital Counter	200-225mm	368-321	0.005mm	0.01mm		
	225-250mm	368-322	0.005mm	0.01mm		
	250-275mm	368-323	0.005mm	0.01mm		
	275-300mm	368-324	0.005mm	0.01mm		

NOTE 1: “HOLTEST” sets are not available over 200mm range. Choose individual sizes as shown above - and Set Frames as described on the following pages.

NOTE 2: Items shown above as of Fixed Anvil type. For Interchangeable Type Anvils, see following pages.



SETTING RINGS AND SETTING FRAMES

Series 177

SETTING RINGS - Series 177

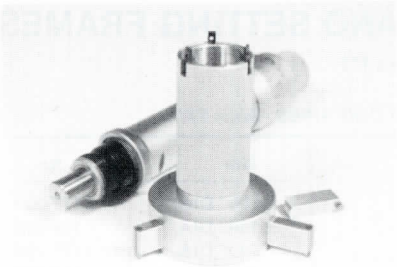
	Size	No.
INCH	.100" DIA.	177-209
	.160" DIA.	177-206
	.240" DIA.	177-207
	.350" DIA.	177-179
	.500" DIA.	177-180
	.650" DIA.	177-182
	1.000" DIA.	177-184
	1.400" DIA.	177-185
	1.800" DIA.	177-186
	2.000" DIA.	177-187
	2.800" DIA.	177-188
	3.600" DIA.	177-189
METRIC	2.5mm DIA.	177-208
	4mm DIA.	177-204
	5mm DIA.	177-205
	8mm DIA.	177-125
	10mm DIA.	177-126
	16mm DIA.	177-177
	25mm DIA.	177-139
	35mm DIA.	177-140
	45mm DIA.	177-178
	50mm DIA.	177-146
	70mm DIA.	177-147
	90mm DIA.	177-148

SETTING FRAMES - Series 177

for "HOLTEST" use only

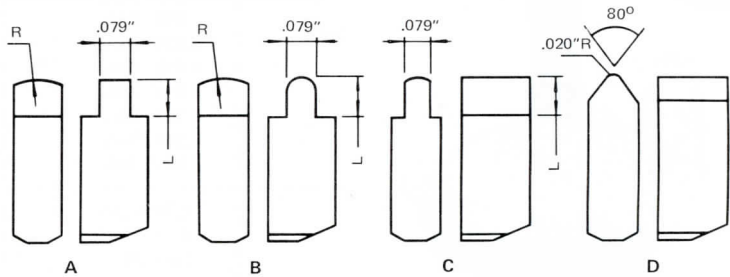
	Size	No.
INCH	5.7"	177-200
	7"	177-199
	9"	177-201
	11"	177-202
	9, 11"	177-203
METRIC	125mm	177-192
	175mm	177-193
	125, 175mm	177-194
	225mm	177-195
	275mm	177-196
	225, 275mm	177-197

Actual Size (as registered on Certificate) is engraved on each MITUTOYO Setting Ring and Frame.



INTERCHANGEABLE ANVILS

For .700–2.2" (1.7–55mm) Range



L = .098" up to 1" (25mm) Range, .118" thereafter.

R = Unspecified radius is smaller than 1/8 of the smallest measurable diameter.

Note: The measuring range increases by .200" (5mm) when these interchangeable anvils are inserted.

	Range	A. Anvils for Square Groove	B. Anvils for Round Groove	C. Anvils for Spline	D. Anvils for Serration	Applicable To
		No.	No.	No.	No.	"Holtest" No.
Inch	.700 - .850"	952971	952987	953003	953019	368-204
	.850 - 1.000"	952972	952988	953004	953020	368-205
	1.000 - 1.200"	952973	952989	953005	953021	368-206
	1.200 - 1.400"	952974	952990	953006	953022	368-207
	1.400 - 1.600"	952975	952991	953007	953023	368-208
	1.600 - 1.800"	952976	952992	953008	953024	368-209
	1.800 - 2.000"	952977	952993	953009	953025	368-210
	2.000 - 2.200"	952978	952994	953010	953026	368-211
Metric	17 - 21mm	952963	952979	952995	953011	368-104
	21 - 25mm	952964	952980	952996	953012	368-105
	25 - 30mm	952965	952981	952997	953013	368-106
	30 - 35mm	952966	952982	952998	953014	368-107
	35 - 40mm	952967	952983	952999	953015	368-108
	40 - 45mm	952968	952984	953000	953016	368-109
	45 - 50mm	952969	952985	953001	953017	368-110
	50 - 55mm	952970	952986	953002	953018	368-111

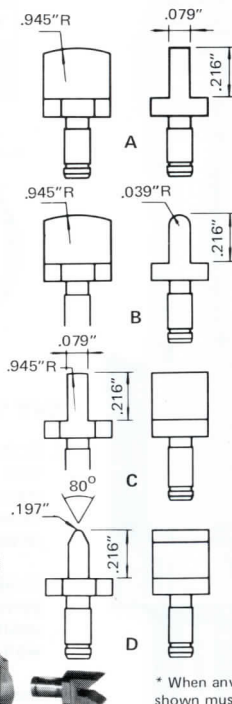


INTERCHANGEABLE ANVILS

For 2.2–12.2"

(55–305mm) Range

368-515



A. Anvils for Square Groove

	No.	Value to add*
Inch	952959	.200"
Metric	952955	5mm

B. Anvils for Round Groove

	No.	Value to add*
Inch	952960	.200"
Metric	952956	5mm

C. Anvils for Spline

	No.	Value to add*
Inch	952961	.200"
Metric	952957	5mm

D. Anvils for Serration

	No.	Value to add*
Inch	952962	.200"
Metric	952958	5mm

* When anvils are inserted in the "Holtest", the value shown must be added to the reading.

Inch

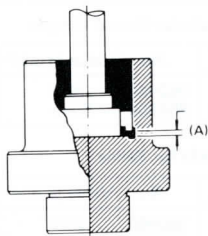
Metric

Range	No.	Graduation	Range	No.	Graduation
2.2 - 2.6"	368-612	.0002"	55 - 65mm	368-512	0.005mm
2.6 - 3.0"	368-613	.0002"	65 - 75mm	368-513	0.005mm
3.0 - 3.4"	368-614	.0002"	75 - 85mm	368-514	0.005mm
3.4 - 3.8"	368-615	.0002"	85 - 95mm	368-515	0.005mm
3.8 - 4.2"	368-616	.0002"	95 - 105mm	368-516	0.005mm
4.2 - 5.2"	368-617	.0002"	105 - 130mm	368-517	0.005mm
5.2 - 6.2"	368-618	.0002"	130 - 155mm	368-518	0.005mm
6.2 - 7.2"	368-619	.0002"	155 - 180mm	368-519	0.005mm
7.2 - 8.2"	368-620	.0002"	180 - 205mm	368-520	0.005mm
8.2 - 9.2"	368-621	.0002"	205 - 230mm	368-521	0.005mm
9.2 - 10.2"	368-622	.0002"	230 - 255mm	368-522	0.005mm
10.2 - 11.2"	368-623	.0002"	255 - 280mm	368-523	0.005mm
11.2 - 12.2"	368-624	.0002"	280 - 305mm	368-524	0.005mm

Note: Above items are without anvils.

"HOLTEST"

Series 368



The dimension (A) is from the bottom of a blind hole to the carbide-faced measuring anvils.

From the cut-out view of a cylinder shown above, it is evident that the "Holtest" measures close to the bottom of blind holes and is sufficient for measuring ID's located near the bottom.

The dimension (A) shown above is as follows:

"Holtest" with carbide anvils		"Holtest" without carbide anvils	
Range	(A)	Range	(A)
.080 - .280"	0	.650 - .800"	.12"
.275 - .500"	.10"	.800 - 2"	.12"
.500 - 2"	.02"	2 - 12"	.79"
2 - 4"	.10"		
4 - 12"	.44"		

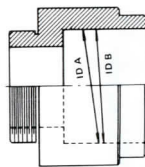
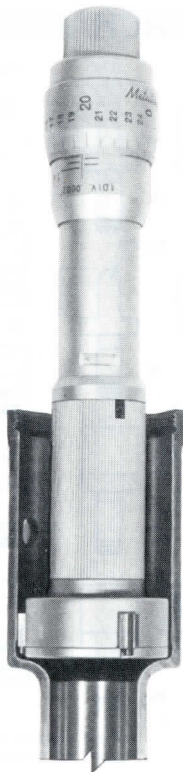


Fig. 1

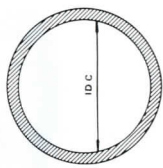


Fig. 2

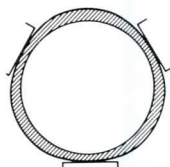


Fig. 3

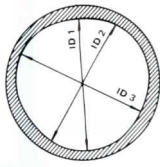
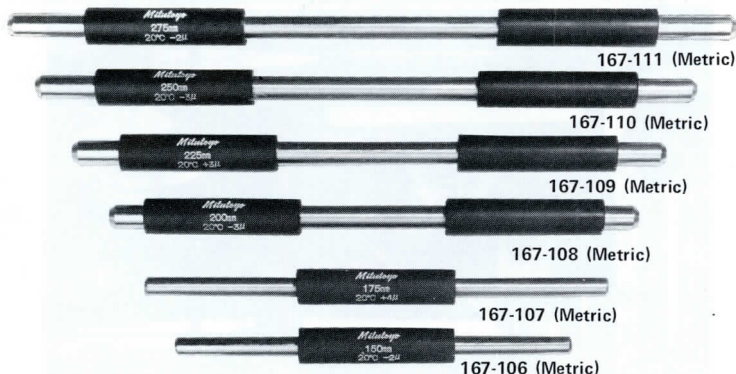


Fig. 4

WHY "HOLTEST"?

1. Holtest never fails to find true alignment with the axis of a turned workpiece and measure an accurate ID, because of its three, evenly-spaced, 120°-apart measuring anvils.
2. Unlike a dial bore gage, which makes two-point contact, Holtest provides three, positive point-contacts against the internal wall-surface.
3. Inaccurate measurements, such as ID A, B and C (See Figs. 1 and 2), simply do not take place with Holtest. The operator consistently makes accurate ID measurements, and does so in less time.
4. Holtest measures recessed grooves, splines, serrations and other complex IDs when additional interchangeable anvils are utilized.
5. Holtest detects the distortion in thin, ring-like workpieces that have been machined while subject to excessive chuching forces (See Fig. 3). The perfectly machined ID in such a piece will lose its trueness when the piece is dismounted and springs back to its original shape (See Fig. 4). A two-point-contact gage cannot always find such distortion, since ID 1, 2 and 3 may be of equal length. Holtest, however, with its three fixed anvils will reveal the distortion, if it is measurable.



MICROMETER STANDARDS Series 167

MITUTOYO Standards are primarily used for the calibration of micrometers. They are also used as a spacing bar for stages, or checking accuracy of Vernier and Dial Calipers. Both ends of the standards are hardened, ground and lapped flat to meet gaging requirements.

All Standards come with a handle which prevents expansion due to body temperature.

- With heat insulating handle.
- Flat and lapped measuring ends.
- Larger sizes are chrome plated.

Size	No.	Size	No.	Size	No.	Size	No.
1"	167-141	14"	167-154	27"	167-167	25mm	167-101
2"	167-142	15"	167-155	28"	167-168	50mm	167-102
3"	167-143	16"	167-156	29"	167-169	75mm	167-103
4"	167-144	17"	167-157	30"	167-170	100mm	167-104
5"	167-145	18"	167-158	31"	167-171	125mm	167-105
6"	167-146	19"	167-159	32"	167-172	150mm	167-106
7"	167-147	20"	167-160	33"	167-173	175mm	167-107
8"	167-148	21"	167-161	34"	167-174	200mm	167-108
9"	167-149	22"	167-162	35"	167-175	225mm	167-109
10"	167-150	23"	167-163	36"	167-176	250mm	167-110
11"	167-151	24"	167-164	37"	167-177	275mm	167-111
12"	167-152	25"	167-165	38"	167-178	300mm	167-112
13"	167-153	26"	167-166	39"	167-179		

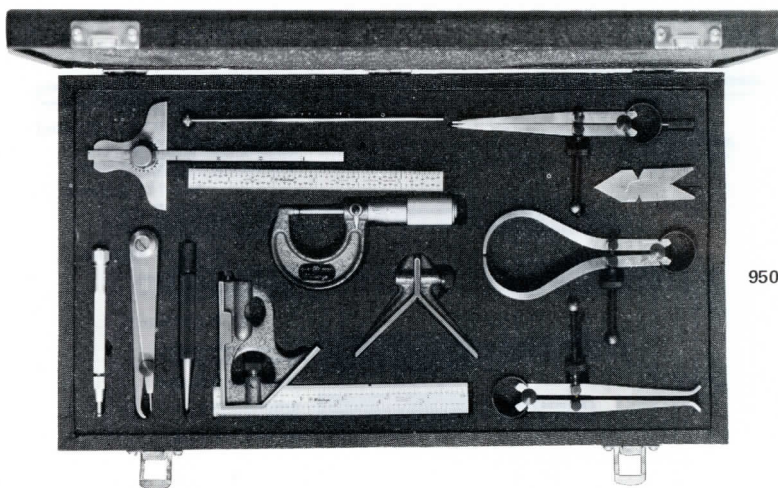
Standards for Thread Micrometers



167-294

1" x 60°	167-294
2" x 60°	167-295
3" x 60°	167-296
4" x 60°	167-297
5" x 60°	167-298

Set of Standards 1"–11" 167-913 (Supplied in fitted carrying case.)



950-901

TOOL KIT

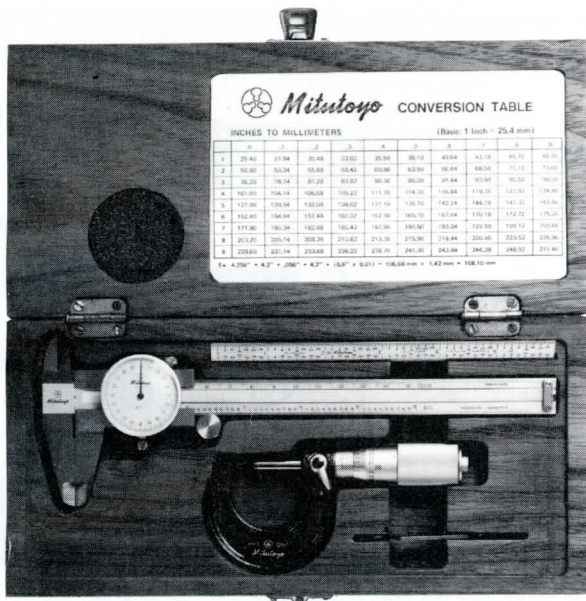
The Tool Kit selected by MITUTOYO is used for machinists, machinist apprentices and vocational school students who would be required to master the use of basic measuring instruments.

All items included in the Tool Kit are for the metalworking industry, and are not aimed primarily at the vocational market. Each tool included in the kit is therefore a high quality product traceable to the National Bureau of Standards or meets applicable Federal Specifications.

The Tool Kit consists of:

1. 0-1" Outside Micrometer (103-127). Graduation .001", with carbide measuring faces, lock and friction thimble.
2. 6" Combination Set (180-901) consisting of Square Head, Center Head and satin chromed 6" Blade with 1/8", 1/16", 1/32", 1/64" graduations.
3. 6" Flexible Steel Rule (182-201). Satin chrome finished. Graduations same as those of Blade.
4. 4" Outside Spring Caliper (950-221). Brushed, natural steel finish. Ends fully rounded to give accurate contact with work.
5. 4" Spring Divider (950-211). High carbon steel legs deeply heat treated for lifetime service.
6. 4" Inside Spring Caliper (950-231). Contact ends fully rounded to give accurate measurements.
7. Adjustable Angle Depth Gage (950-271). The depth bar with 1/32" and 1/64" graduations also measures angle at 15° increments, and can be interchanged with a depth rod provided.
8. Center Gage (950-201). Hardened with lapped edges and notches according to American National and US 60° standards.
9. Hermaphrodite Caliper (950-241). Scribes or measures from edge with adjustable point.
10. Pocket Scriber (950-261).
11. Center Punch (950-251).

No.	Description
950-901	TOOL KIT with all 11 items as described above.



950-902

TOOL KIT-A

Basic and most often used three measuring tools, 6" steel rule, 1" micrometer and 6" dial caliper, are assembled in a rugged wooden case.

An inch to metric conversion table is attached on the top lid for quick reference.

- 182–201 6" satin chrome finish full-flexible rule. Graduations; 1/8, 1/16, 1/32, 1/64ths.
- 103–127 1" outside micrometer. Smallest graduation .001". With carbide tipped measuring faces, lock nut, satin chromed sleeve and thimble. Friction thimble is also provided for constant measuring pressure.

- 505–626 6" dial caliper. This unit is the most popular model among more than 2 dozen types of dial calipers available from MITUTOYO.

The smallest graduation is .001". One half of the dial indicates .100". One complete revolution of dial hand represents .200". The main graduations are in .100" and one millimeter. Metric graduations on the upper beam is for a rough reference purpose. The main beam is satin chromed for glare-free reading. The entire dial caliper is made of hardened stainless. MITUTOYO dial caliper measures inside, outside, depth and step dimensions. This feature is called "Quadri 4-way measurement", and is unique and useful feature.

No.	Description
950-902	TOOL KIT with all 3 items as described above.



146-104
(Patented)



146-102
(Patented)



210-104
(Patented)

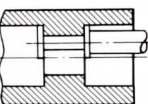
MULTI-MIKE & MINI-MIKE

Series 146

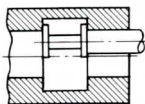
Multi and Mini-Mikes are designed for measuring grooves, recesses and shoulders located inside the bore as illustrated below. Multi-Mike has .500" dia. discs, and the Mini-Mike comes with .250" dia. discs to reach hard-to-get-at places inside a small bore.

All disc thicknesses are .025" (0.75mm), and are hardened and lapped to minimize parallax and to achieve a higher degree of accuracy.

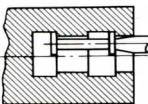
The Multi and Mini-Mikes measure not only thickness and spacing of grooves, but also measure from an edge to a land, or from shoulder to groove. Both micrometers are satin chrome finished throughout.



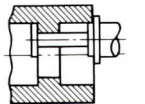
Outside measurement



Inside measurement, add
.050" (1.5mm) to the reading



Edge to edge measurement,
add .025" (0.75mm) to the
reading.



Edge to edge measurement with
locating disc, add .025" (0.75mm)
to the reading.

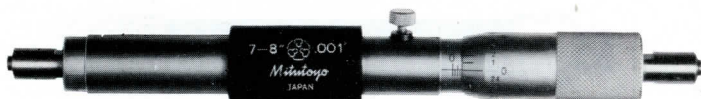
DIAL GROOVE GAGES

Series 210

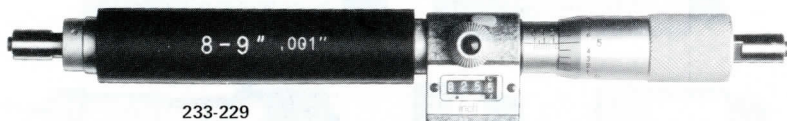
The measuring disc of the Dial Groove Gage does not rotate in the groove and, therefore, prevents the disc from slipping. It is activated by the trigger which extends the distance between the two discs simply and positively.

The Dial Indicator is connected directly to the disc rod and reads to thousandths. Complete with fitted carrying case.

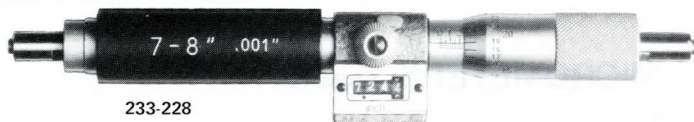
Series 146	Range		No.	Grad.	Dia. of Measuring Faces
	Outside	Inside			
INCH	0 - 1"	.050-1.050"	146-102	.001"	.250"
	0 - 1"	.050-1.050"	146-104	.001"	.500"
	1 - 2"	1.050-2.050"	146-106	.001"	.500"
	2 - 3"	2.050-3.050"	146-108	.001"	.500"
	3 - 4"	3.050-4.050"	146-110	.001"	.500"
METRIC	0-25mm	1.5-26.5mm	146-101	0.01mm	6.35mm
	0-25mm	1.5-26.5mm	146-103	0.01mm	12.7 mm
Series 210	0 - 1"	.050-1.050"	210-102	.001"	.250"
	0 - 1"	.050-1.050"	210-104	.001"	.500"



133-228



233-229



233-228

TUBULAR INSIDE MICROMETERS Series 133

Single Rod Type 2-3" up to 11-12" and sets

DIGIT TUBULAR INSIDE MICROMETERS Series 233

Single Rod Type From 5-6" To 11-12"

The rod type inside micrometer featured with carbide faced spherical contact points is a recommended measuring gage to check inside dimensions.

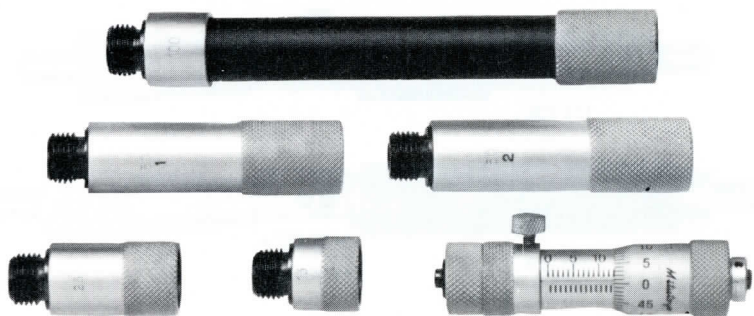
It can also be used as an adjustable linear standard bar within the range.

Both measuring tips are carbide faced and are spherical to make positive point contact against the inside wall surfaces. The micrometer head is graduated in one thousandth. In the case of digital version, the micrometer head movement is synchronized with the digital counter.

- Supplied in a carrying case.

- Accuracy up to 4" ----- .00015"
4 - 6" ----- .0002"
6 - 12" ----- .0003"
- With positive locking clamp.
- Zero point can be readjusted by twisting the micrometer head sleeve. A key wrench is supplied.
- 2-6" set and 2-12" set are available. (133 series only)
- Clear crisp graduations on the satin chrome finished micrometer head.

	Range	No.	Graduation
133 SERIES	2 - 3"	133-223	.001"
	3 - 4"	133-224	.001"
	4 - 5"	133-225	.001"
	5 - 6"	133-226	.001"
	6 - 7"	133-227	.001"
	7 - 8"	133-228	.001"
	8 - 9"	133-229	.001"
	9 - 10"	133-230	.001"
	10 - 11"	133-231	.001"
	11 - 12"	133-232	.001"
133 SERIES Sets	2 - 6"	133-903	.001"
	2 - 12"	133-904	.001"
233 SERIES	5 - 6"	233-226	.001"
	6 - 7"	233-227	.001"
	7 - 8"	233-228	.001"
	8 - 9"	233-229	.001"
	9 - 10"	233-230	.001"
	10 - 11"	233-231	.001"
	11 - 12"	233-232	.001"



137-102

INSIDE MICROMETERS Series 137

Extension Rod Type

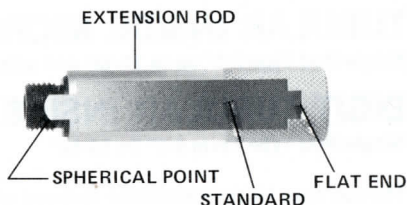
METRIC

The extension rod type Inside Micrometer covers a range of 250mm, from 50mm to 300mm, and measures .01mm with the Micrometer Head. The rod includes one 1000mm, two 50mm, one 25mm and 13mm which are quickly mounted to the Micrometer Head. Each rod conceals a calibrated standard.

It is this standard that makes contact with another calibrated standard.

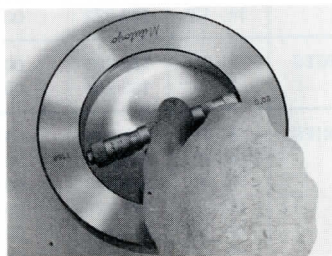
ENGLISH

The English versions are available in 2 ranges; 2-12", and 2-40". Differences between the 137 series and 139/140 series are that the 137 series rods are featured with internal standards whereas the others are of a tubular construction. To attain maximum accuracy, one end of the internal standard has a spherical point, while the other end is lapped flat.



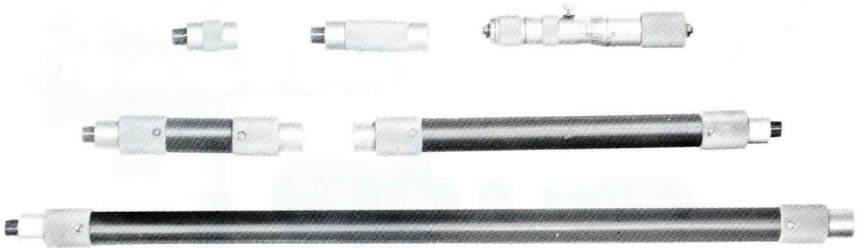
Each length of the extension is determined by a standard which is a major part of the extension. When extensions are put together, the standard makes positive contact with the other.

- Travel of the Micrometer Head 13mm.
- The Micrometer Head can be easily adjusted by turning the sleeve with supplied wrench.
- Glare free satin-chrome finish on the head. Clear graduations.
- Each extension rod is marked with its length.
- Makes point contact with the wall surface.
- Complete with fitted carrying case.
- Accuracy



Inside Micrometer is being calibrated by the Setting Ring for Holtests, Series 177

Range	No.	Graduation
2 - 12"	137-112	.001"
2 - 40"	137-114	.001"
50 - 300mm	137-102	.01mm
50 - 1000mm	137-104	.01mm



139-179

TUBULAR INSIDE MICROMETERS

Heavy Duty IM-J Type Series 139

- Accuracy: .0007" up to 20" and .001" up to 40" and .0014" up to 52".
- Carbide measuring faces.
- Satin chrome finished head.
- Diameter of extension tube .669".
- Anvil and both ends of extension tubes are hardened, ground and micro-lapped.
- Set consists of inside micrometer head and a series of extension tubes of different lengths.
- Range of micrometer head 4-5".
- Positive locking — clamp locks spindle at any desired setting.
- Clear crisp black graduations on satin chrome finish for easy reading.
- Heat insulated extension tubes.
- Larger sizes are available on special request.
- Complete with fitted carrying case.

Extra Heavy Duty IM-LP Type Series 140

- Accuracy: .0029" up to 120", .0037" up to 160" and .0045" up to 200".
- Carbide measuring faces.
- 2 inch travel micrometer head.
- Satin chrome finished head.
- Positive locking — clamp locks spindle at any desired setting.
- Diameter of extension tube 1.26".
- Anvil and both ends of extension tubes are hardened, ground and micro-lapped.
- Clear crisp black graduations for easy reading.
- Set consists of inside micrometer head and a series of extension tubes of different lengths. Main Tube 40".
- Complete with fitted carrying case.

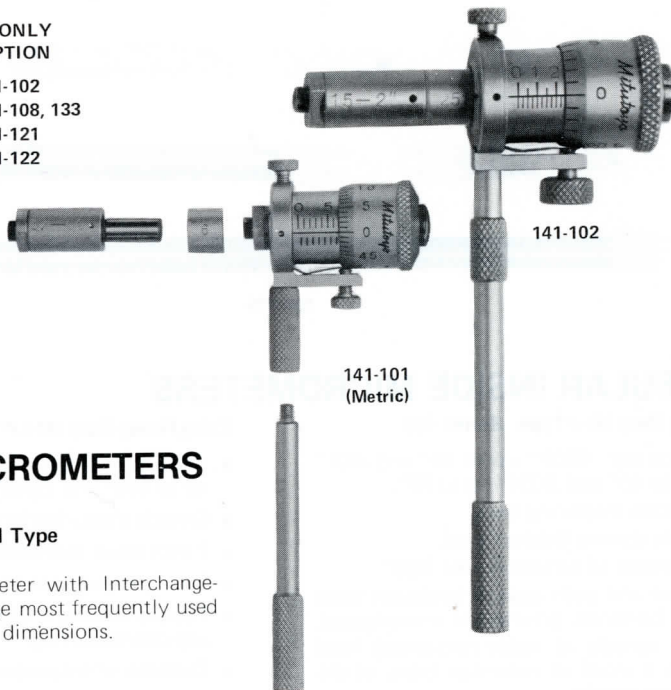
Micrometer Head

Range	No.	Range	Graduation	Extension Tube
4 - 20"	139-178	1"	.001"	1", 2", 4", 8"
4 - 36"	139-179	1"	.001"	1", 2", 4", 8", 16"
4 - 52"	139-180	1"	.001"	1", 2", 4", 8", 16", 16"
40 - 120"	140-162	2"	.001"	2", 4", 4", 8", 20", 40"
40 - 160"	140-163	2"	.001"	2", 4", 4", 8", 20", 40", 40"
40 - 200"	140-164	2"	.001"	2", 4", 4", 8", 20", 40", 40", 40"



MICROMETER HEAD ONLY PARTS NO. DESCRIPTION

980235	For 141-102
980239	For 141-108, 133
980320	For 141-121
980243	For 141-122



INSIDE MICROMETERS

Series 141

Interchangeable Rod Type

The Inside Micrometer with Interchangeable Rods is the gage most frequently used for measuring inside dimensions.

No. 141-102

As shown here, the Micrometer Head has a 0-.250" range reading in thousandths. A detachable holder provides easy access when measuring inside diameters within deep holes. For 1" to 1.250" range, the micrometer is used without the rod or collar.

For 1.250" to 1.500" range, a .250" collar is added between the rod and head. For 1.500" to 1.750" range, the rod is replaced. For 1.750" to 2", the collar is added between the rod and head. Thus, it measures 1" to 2" — .250" at a time.

No. 141-133

Since this Inside Micrometer comes with a .500" range Micrometer Head, the combining of rod and collar is made simpler. For instance: the rod is marked 5-6" measures from 5" to 5.500". For the 5.500" to 6" range, the .500" collar is added.

Both measuring ends are hardened and have micro-lapped finish for lasting accuracy.

PARTS

Individual Rod and Collar

For No. 141-102		For No. 141-101	
Size	No.	Size	No.
1.5-2"	300914 (Rod)	12mm	300957 (Collar)
.250"	300926 (Collar)	38mm	300911 (Collar)
.500"	300958 (Collar)	50mm	300913 (Collar)
For No. 141-133		For No. 141-105	
2-3"	300964 (Rod)	75mm	300963 (Rod)
3-4"	982006 (Rod)	100mm	982005 (Rod)
4-5"	982008 (Rod)	125mm	982007 (Rod)
5-6"	982010 (Rod)	150mm	982009 (Rod)
6-7"	982012 (Rod)	175mm	982011 (Rod)
7-8"	982014 (Rod)	200mm	982013 (Rod)
8-9"	982016 (Rod)	225mm	982015 (Rod)
9-10"	982018 (Rod)	250mm	982017 (Rod)
10-11"	982020 (Rod)	275mm	982019 (Rod)
11-12"	982022 (Rod)	300mm	982021 (Rod)



141-133



INSIDE MICROMETERS

Interchangeable Rod Type Series 141

The 141 Series Inside Micrometers are probably the most frequently used inside measuring instruments because of their wide range and simplicity in measuring operation. No. 141-133, shown above, consists of 9 interchangeable rods, .500" micrometer head, .500" collar and handle. The range covered by this unit is 2" to 12".

To provide point contact, all contact points are made spherical and hardened for extra long tool life. The overall accuracy is .0004" up to 12" (300mm), .001" thereafter to 40". The accuracy of the micrometer head alone is $\pm .00012$ " up to 12" (300mm) model, $\pm .00015$ " for 20" and 40" models.

- Each interchangeable rod is marked with its measuring range.
- Both micrometer head and furnished rods are satin-chrome finished throughout.
- Positive locking clamp attached on No. 141-101 and 141-102. No lock on the larger sizes.
- Supplied with fitted carrying case.

For closer tolerance work it is recommended that the micrometer with a rod inserted be calibrated with a known size such as a ring gage. The setting ring for "Holtest" would be an ideal choice.

	Range	No.	Travel of Micrometer Head	Grad.	Number of Rods	Spacing Collar	Diameter of Rods
INCH	1 - 2"	141-102	.250"	.001"	2	.250"	.248"
	2 - 8"	141-108	.500"	.001"	6	.500"	.248"
	2 - 12"	141-133	.500"	.001"	10	.500"	.248"
	8 - 20"	141-121	1"	.001"	3	1", 2"	.355"
	8 - 40"	141-122	1"	.001"	8	1", 2"	.355"
METRIC	25 - 50mm	141-101	7mm	0.01mm	2	6mm	6.3mm
	50 - 200mm	141-105	13mm	0.01mm	6	12mm	6.3mm
	50 - 300mm	141-106	13mm	0.01mm	10	12mm	6.3mm



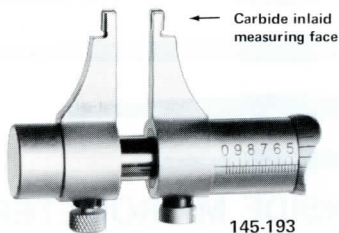
145-193

INSIDE MICROMETERS

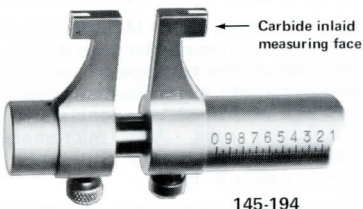
Caliper Type 0.2"-1" and 1/2" Series 145

All Mitutoyo Micrometers meet or exceed federal specifications for accuracy.

- Accuracy to .0002" with graduations of .001"
- Easy zero adjustment.
- Clear graduations on satin-chrome finish.
- Caliper type jaws are made of high grade tool steel. They are satin-chrome finished.
- Barrel and thimble are satin-chrome finished.
- Measuring faces have carbide inserts, precision ground and micro-lapped.
- Locking clamp for positive locking of spindle.
- With ratchet stop.
- Every thousandth is numbered for easy reading.
- Easily adjusted for slide movement of sliding jaw. (Exclusive).
- Spanner wrench is supplied with every micrometer.
- Complete with fitted carrying case.



145-193

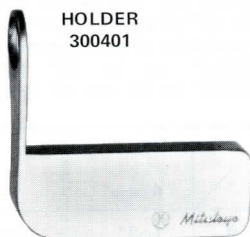


145-194



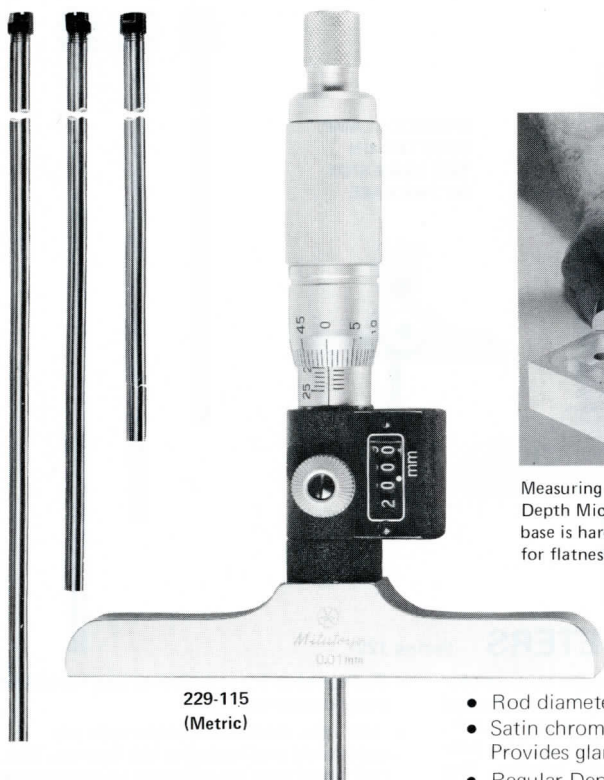
300400

HOLDER
300401

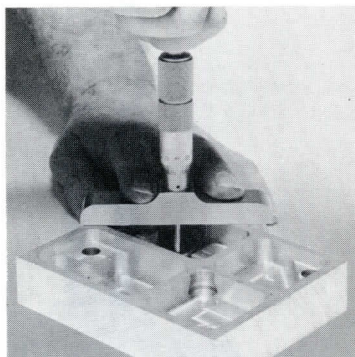


	Range	No.	Grad.
INCH	0.2 - 1"	145-193	.001"
	1 - 2"	145-194	.001"
METRIC	5 - 25mm	145-185	.01mm
	25 - 50mm	145-186	.01mm

Special holder is available for production type inside measurements where a considerable number of work pieces are to be inspected within a limited time. The holder must be used with No. 156-101 Mitutoyo Stand or any other similar stand or vise available in the shop.



229-115
(Metric)



Measuring depth with 100mm base regular Depth Micrometer. Bottom surface of the base is hardened, ground and micro-lapped for flatness.

DEPTH MICROMETERS

Interchangeable Rod Type

Series 129, 229

MITUTOYO Depth Micrometers measure depth or step of a work to .01mm with easily interchangeable rods, and are available in three ranges with or without digital counter. The base width is approximately 18.3mm, while the length is either 60mm or 100mm depending upon the unit selected.

Depth Micrometers are satin chrome finished throughout, and provide crisp, clear, glare-free graduations. The furnished interchangeable rods, with 25mm length increments, are easy to change. Overall length can be adjusted by the wrench supplied.

Measuring end of the rods is hardened, ground and lapped for maximum accuracy.

- Rod diameter approximately 4mm.
- Satin chrome finished throughout. Provides glare-free readings.
- Regular Depth Micrometers come with a ratchet stop for consistent measurements.
- Digital Counter Depth Micrometers have friction thimble.
- Positive locking clamp is provided on the Digital Counter models.
- Complete with fitted carrying case.

Range	No.	Grad.	Base Length	No. of Rods
0 - 100mm	129-111	.01mm	60mm	4
0 - 150mm	129-112	.01mm	60mm	6
0 - 100mm	129-115	.01mm	100mm	4
0 - 150mm	129-116	.01mm	100mm	6

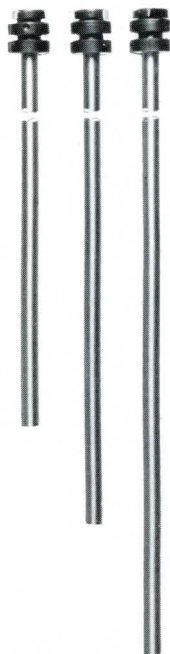
With DIGITAL COUNTER

0 - 100mm	229-111	.01mm	60mm	4
0 - 100mm	229-115	.01mm	100mm	4
0 - 150mm	229-116	.01mm	100mm	6



129-127

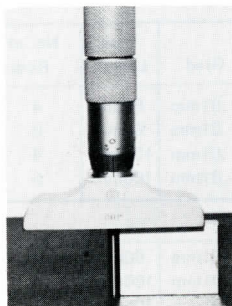
SPINDLE CLAMP
LOCATED ON
THE REAR SIDE
OF THE BASE



DEPTH MICROMETERS Series 129

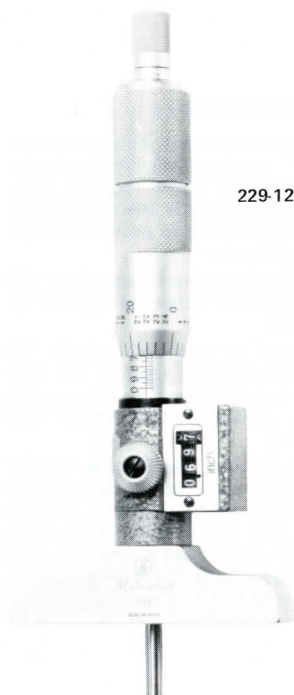
The extra rigid MITUTOYO Depth Micrometer is one of the basic measuring tools selected by machinists. The width of the base, .63", by far the widest available in the market, provides extra stability in depth gaging. The base span is made in a 2½" or 4" size. The entire bottom surface is micro-lapped to achieve a higher degree of accuracy. Completely satin-chrome finished.

- Ratchet stop for consistent and repetitive measurements.
- .157" dia. interchangeable rods are calibrated and tested at the factory. The rod length can be adjusted to compensate wear on the measuring tip with two supplied wrenches.
- Rod diameter .157" dia. lapped measuring end.
- Satin-chromed finish throughout.
- Crisp clear graduations on the thimble.
- Accuracy .0003"; graduation .001".
- Complete with fitted carrying case.



To zero-adjust depth micrometer periodically, or check accuracy whenever the rod is changed, use Mitutoyo gage blocks shown in this catalog.

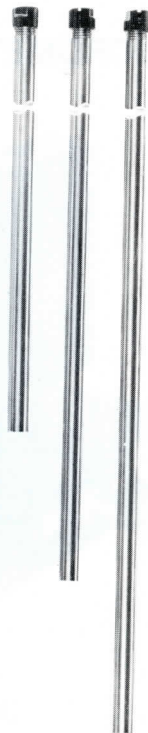
Range	No.	Base Size	No. of Rods
0 - 4"	129-127	2½"	4
0 - 6"	129-128	2½"	6
0 - 12"	129-149	2½"	12
0 - 4"	129-131	4"	4
0 - 6"	129-132	4"	6
0 - 12"	129-150	4"	12



229-127



229-131



DIGIT DEPTH MICROMETERS

Interchangeable Rod Type

Series 229

The Digital Counter of this depth micrometer provides clear, accurate readings in thousandths.

Conventional models with reversed thimble and sleeve were rather awkward and took extra attention and a long time to read.

With MITUTOYO's Digit Depth Micrometers, the answer is shown in decimals to thousandths.

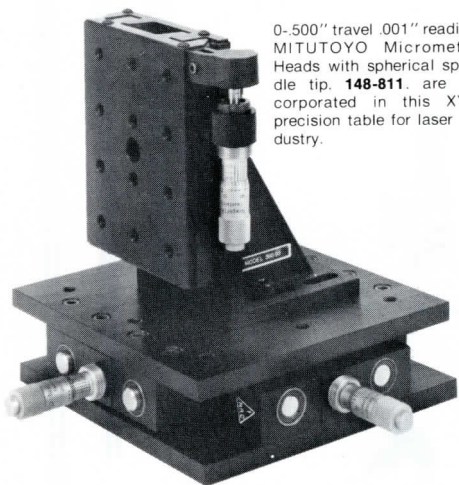
- Base length 2½" or 4", base width .63", satin chromed and the entire bottom surface is micro-lapped for accuracy.
- With easily interchangeable rods.
- Friction thimble provides consistent pressure.
- With positive locking clamp.

- Conventional Sleeve/Thimble is still provided to double check the digital counter.
- Interchangeable rod diameter .157".
- Clear crisp graduations on the thimble. No glare satin chrome finish.
- Complete with fitted carrying case.

Range	No.	Grad.	Base Length	No. of Rods
0 - 4"	229-127	.001"	2½"	4
0 - 6"	229-128	.001"	2½"	6
0 - 4"	229-131	.001"	4"	4
0 - 6"	229-132	.001"	4"	6



MICROMETER HEADS



0-.500" travel .001" reading MITUTOYO Micrometer Heads with spherical spindle tip. **148-811**. are incorporated in this XYZ precision table for laser industry.

APPLICATION EXAMPLE

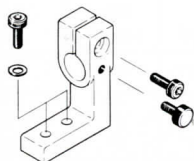
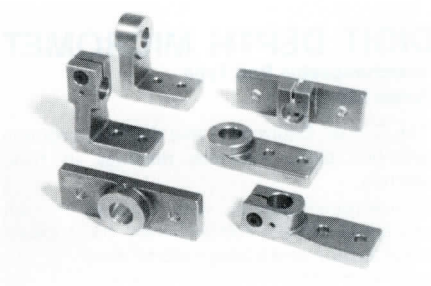
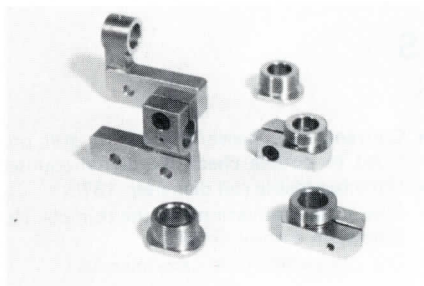
Small micrometer heads, such as 0-1/2" range .001" reading, 148 Series are incorporated in laser mirror mounts, optical targets, XYZ mounts and many other scientific equipments to provide minute linear adjustments.

The example shown here uses three 148 Series Heads with spherical spindle tip (No. 148-811).

The spherical or crowned spindle tip makes point contact against the wall surface, thus eliminating alignment error, and, creates ideally linear feed adjustments.

Larger micrometer heads offer .0001" direct reading and many are featured with bi-directional graduations. Except 148 series and few other items, most micrometer heads are standard with carbide-faced spindle for high-precision measurements.

MOUNTING FIXTURES for Series 148, 149, 150 and 250



To mount Series 148, 149, 150 & 250 Micrometer Heads onto jigs and fixtures, MITUTOYO offers 29 cast stainless holders such as those shown here.

Except threaded fixtures for direct mounting, all holes are through holes. The 1/1 scale (actual size) drawings on fixtures and Micrometer Heads are available upon request.



MICROMETER HEADS SELECTION GUIDE

Series	Range	Graduation	Description
110	0-.050" 0-25mm	.000050" .000005" 0.001mm 0.0001mm	Differential Screw Translator. Because of the special double screw threads construction, graduations are extremely fine and non-rotating spindle movement is minute.
148	0-.275" 0-.500" 0-13mm	.001" .001" 0.01mm	Available with flat or spherical spindle tip. Regular or reversed graduations. One of the most frequently chosen micrometer heads.
149	0-.500" 0-13mm	.001" 0.01mm	Available with flat or spherical carbide spindle-tip. Regular or reversed graduations.
150	0-1" 0-25mm	.001" 0.01mm 0.001mm	Standard 0-1" micrometer head. Available with flat or spherical spindle-tip. Regular or reversed graduations.
151	0-1" 0-2" 0-25mm 0-50mm	.001" .0001" .001" 0.01mm 0.001mm 0.01mm	Heavy-duty type 0-1" micrometer head. 0-2" continuous movement, slim micrometer head
152	0-1" 0-2" 0-25mm 0-50mm	.0001" .0001" 0.005mm 0.002mm 0.002mm	Large diameter thimble (1.93"DIA.) .0001" direct-reading micrometer head. Bi-directional, color-coded graduations. With floating collar and adjustable thimble or without.
153	0-1" 0-25mm	.001" .0001" 0.01mm 0.001mm	Non-rotating spindle micrometer head.
197	0-2" 0-50mm 0-50mm	.0002" 0.005mm	Non-rotating spindle, quick travel micrometer head. 0-2" travel with only 40 revolutions.
250	0-1" 0-25mm	.0001" .0002" 0.01mm 0.001mm	Digit micrometer head. Digital counter indicating to .001" Available in two different types: .250" DIA. spindle or .315" DIA. spindle.
251	0-1" 0-25mm	.0001" .0002" 0.01mm 0.001mm	Digit micrometer head. Heavy-duty version of the 250 Series.
252	0-1" 0-25mm	.0002" 0.0005mm	Digit micrometer head with dual directional counter. Large thimble diameter (2.24" DIA.). With individual zero-set button.
297	0-2" 0-50mm	.0002" 0.005mm	Digital version of the 197 Series Non-rotating spindle, quick travel micrometer head. 0-2" travel with only 40 revolutions.
Special	Special	Special	If none of the above 12 series and more than 70 items still do not meet your requirements, MITUTOYO will manufacture special micrometer heads as per your specifications.



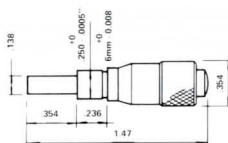
148-112



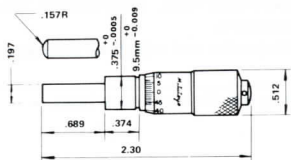
148-501



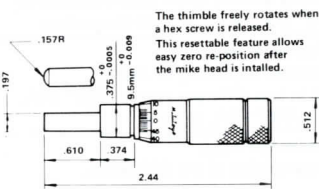
148-502



(AA)

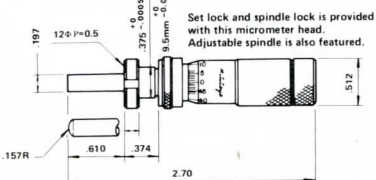


(A)



(B)

The thimble freely rotates when a hex screw is released. This resettable feature allows easy zero re-position after the mike head is installed.



(C)

Set lock and spindle lock is provided with this micrometer head. Adjustable spindle is also featured.

MICROMETER HEADS

Series 148

0-1/2" (0-13mm) travel 148 series micrometer heads are the smallest available from MITUTOYO. Despite their size, the 148 series find a big usage as tools to fine adjust linear distances. The 148 series is available either with flat spindle face (no carbide tip) or .157"R sphere on the measuring tip. The reversed graduations are also available with flat spindle face. All micrometer heads are satin-chrome finished except models made of stainless throughout. Type (B) and (C) models are equipped with fully adjustable thimble.

Range	No.	Grad.	Type	Note
0-.275"	148-211	.001"	AA	Flat spindle
0-.500"	148-112	.001"	A	Flat spindle
0-.500"	148-811	.001"	A	Spherical spindle
0-.500"	148-831	.001"	A	Reversed graduation
0-.500"	148-511	.001"	A	Stainless throughout
0-.500"	148-501	.001"	B	Flat spindle
0-.500"	148-851	.001"	B	Spherical spindle
0-.500"	148-861	.001"	B	Reversed graduation
0-.500"	148-502*	.001"	C	Flat spindle
0-.500"	148-852*	.001"	C	Spherical spindle
0-.500"	148-862*	.001"	C	Reversed graduation
0-13mm	148-201	0.01mm	AA	Flat spindle
0-13mm	148-104	0.01mm	A	Flat spindle
0-13mm	148-801	0.01mm	A	Spherical spindle
0-13mm	148-821	0.01mm	A	Reversed graduation
0-13mm	148-513	0.01mm	A	Stainless throughout
0-13mm	148-503	0.01mm	B	Flat spindle
0-13mm	148-853	0.01mm	B	Spherical spindle
0-13mm	148-863	0.01mm	B	Reversed graduation
0-13mm	148-504*	0.01mm	C	Flat spindle
0-13mm	148-854*	0.01mm	C	Spherical spindle
0-13mm	148-864*	0.01mm	C	Reversed graduation

*with Set Nut and Lock Nut



Carbide Face

All 149 Series are available with spherical face.



149-148



149-182

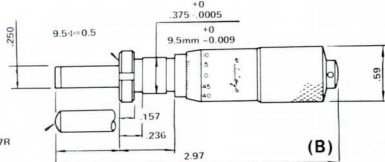
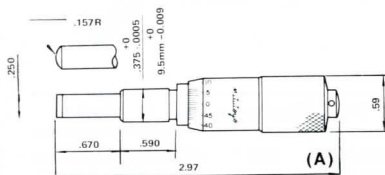


149-131



Carbide Face

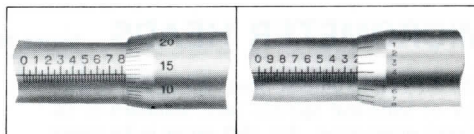
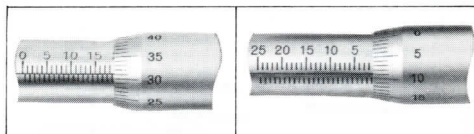
149-132



MICROMETER HEADS

0-1/2" (0-15mm) travel 149 series micrometer head is a heavy duty version of the 148 series described on the preceding page. As the drawing below indicates, the 149 series is larger than 148 series in every respect except .375" shank diameter. The 149 series features carbide tipped spindle face which is not available with 148 series. All micrometer heads are satin-chrome finished.

The 149 series micrometer heads shown here are furnished with the graduations in a standard direction. Numerical order of the graduations can be reversed for the measuring applications where right to left measurement is more critical. Series 148, 149 and 150 micrometer heads feature such reversed graduation units.

Standard Graduation
INCHReversed Graduation
INCHStandard Graduation
METRICReversed Graduation
METRIC

Range	No.	Grad.	Type	Note
0-.500"	149-148	.001"	A	Flat spindle
0-.500"	149-811	.001"	A	Spherical spindle
0-.500"	149-831	.001"	A	Reversed graduation
0-.500"	149-182	.001"	B	Flat spindle
0-.500"	149-812	.001"	B	Spherical Spindle
0-.500"	149-832	.001"	B	Reversed graduation
0-15mm	149-132	0.01mm	A	Flat spindle
0-15mm	149-801	0.01mm	A	Spherical spindle
0-15mm	149-821	0.01mm	A	Reversed graduation
0-15mm	149-131	0.01mm	B	Flat spindle
0-15mm	149-802	0.01mm	B	Spherical spindle
0-15mm	149-822	0.01mm	B	Reversed graduation



All 150 Series are also available with spherical face.



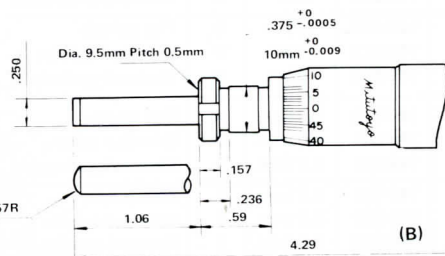
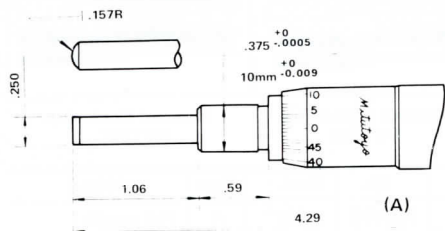
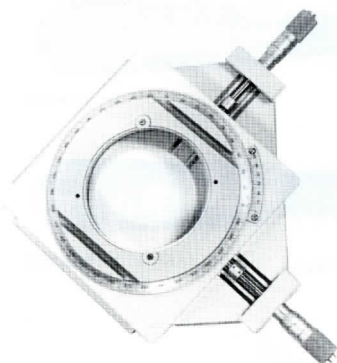
150-208



150-190

MICROMETER HEADS Series 150

150 series micrometer heads are available with flat or spherical spindle face, standard or reversed graduation. All 150 series mike heads are with carbide spindle tip and ratchet stop, and are the smallest 1" travel micrometer heads.



Range	No.	Graduation Type	Note
0-1"	150-208*	.001"	(A) Flat spindle face
0-1"	150-811	.001"	(A) Spherical face
0-1"	150-831	.001"	(A) Reversed grad.
0-1"	150-812	.001"	(B) Spherical face
0-1"	150-832	.001"	(B) Reversed grad.
0-25mm	150-192*	0.01mm	(A) Flat spindle face
0-25mm	150-801	0.01mm	(A) Spherical face
0-25mm	150-821	0.01mm	(A) Reversed grad.
0-25mm	150-802	0.01mm	(B) Spherical spindle
0-25mm	150-822	0.01mm	(B) Reversed grad.
0-25mm	150-190*	0.001mm	(A) Flat spindle face

*Standard items. All 151 Series mike heads are with carbide measuring face and ratchet stop.



151-238



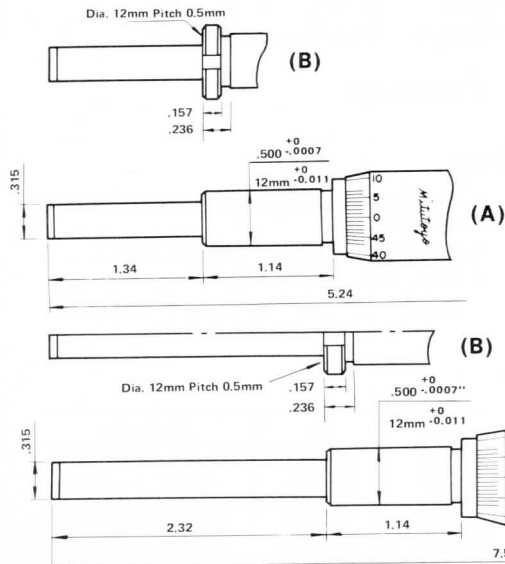
151-222

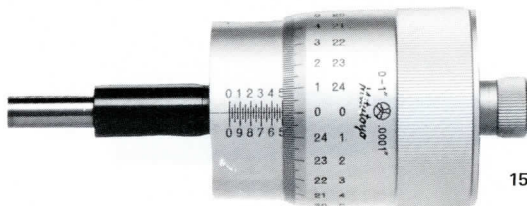
MICROMETER HEADS Series 151

The 151 series offer 1" and continuous 2" travel micrometer heads. Slim 2" heads are often used in laser equipments and other scientific applications. The spindle diameter is .315".

Range	No.	Graduation	Type
0-1"	151-240	.001"	(A)
0-1"	151-239	.001"	(B)
0-1"	151-238*	.0001"	(A)
0-1"	151-237	.0001"	(B)
0-2"	151-272*	.001"	(A)
0-2"	151-271*	.001"	(B)
0-25mm	151-224	0.01mm	(A)
0-25mm	151-223	0.01mm	(B)
0-25mm	151-222*	0.001mm	(A)
0-25mm	151-221	0.001mm	(B)
0-50mm	151-256	0.01mm	(A)
0-50mm	151-255	0.01mm	(B)

*Standard stocked item. All 151 Series mike heads are with ratchet stop and carbide measuring face.

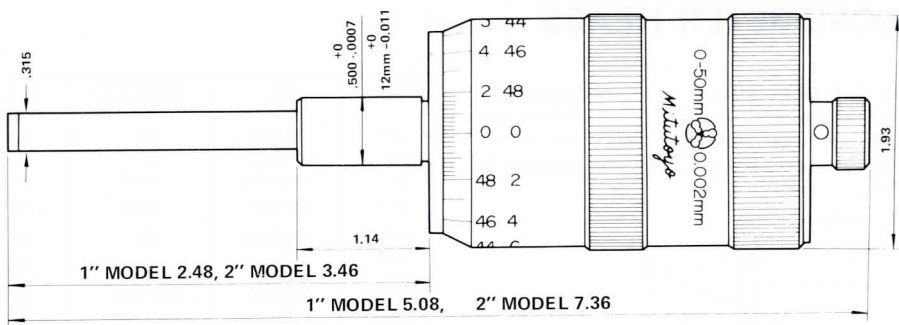




152-372



152-388



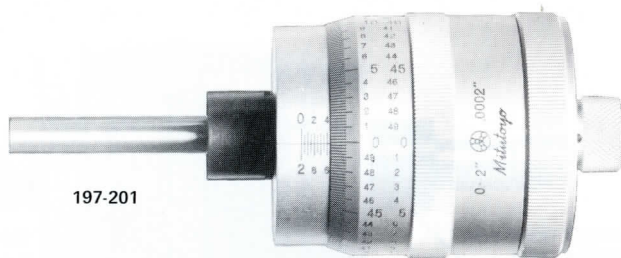
MICROMETER HEADS Series 152

Carbide tipped .314" dia. 1" and 2" travel high accuracy micrometer heads. Both read directly in ten-thousandths on the thimble. The graduations are engraved in plus and minus directions, color coded in red and black for easier reading. A knurled speeder is attached for fast spindle movement.

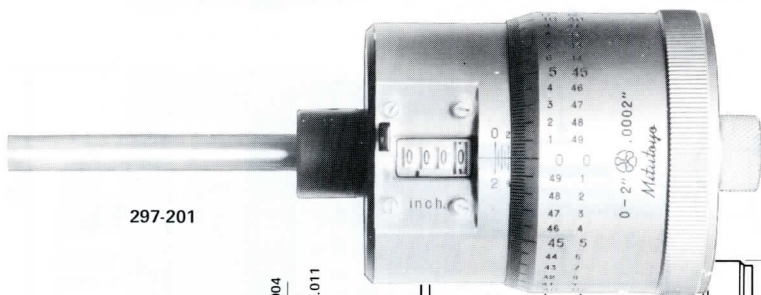
No. 152-388; continuous 0-2" micrometer head reading directly to .0001" without vernier scale. To measure more than 1", a spacer or gage block must be utilized if measurement is taken by 1" travel micrometer head. This practice, to measure 0-2" with 1" head, often creates inaccurate measurement. Use 0-2" continuous movement micrometer head whenever work distance exceeds 1".

- Color coded graduations for plus and minus directions.
- Large thimble reads directly to .0001".
- With flat carbide measuring face and speeder for quick micrometer movements.

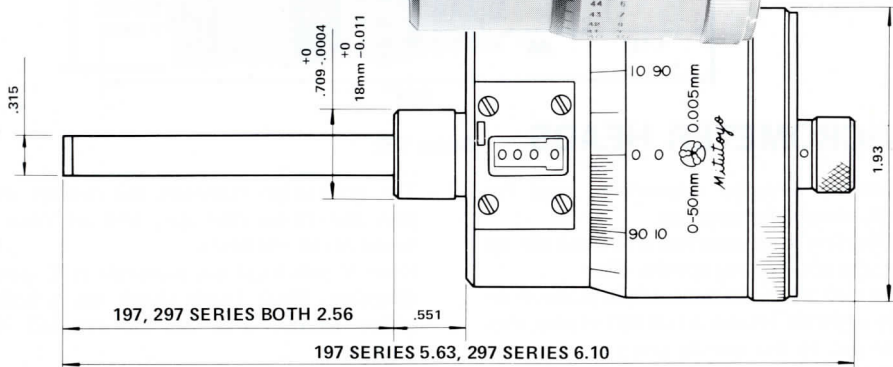
Range	No.	Graduation	
0-1"	152-372	.0001"	w/Speeder
0-2"	152-388	.0001"	w/Speeder
0-25mm	152-348	0.002mm	w/Speeder
0-50mm	152-380	0.002mm	w/Speeder



197-201



297-201



QUICK MICROMETER HEAD

Series 197, Series 297.

WITH NON-ROTATING SPINDLE

197 and 297 series non-rotating micrometer heads have a 2" (50mm) travel capacity with .0002" (0.005mm) smallest reading on the thimble. The spindle travels twice faster than the conventional 40 pitch spindle thread. 197 series without carbide, 297 series is featured with a 4 digit digital counter which provides reading to 0.001" or 0.001mm.

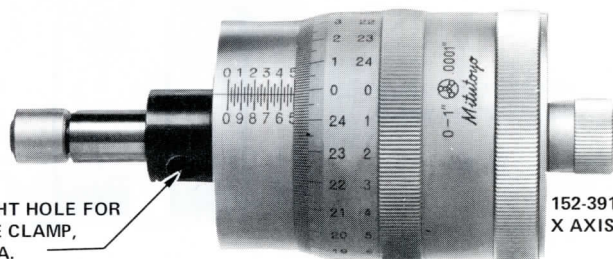
- 197 series has color coded graduations for dual directional readings.

- 297 series features zero re-setting button which floats the center reading to a desired position within the span of 2".

Range	No.	Graduation	Spindle
0-2"	197-201	.0002"	Non-rotating
0-50mm	197-101	0.005mm	Non-rotating
0-2"	297-201	.0002"	Non-rotating
0-50mm	297-101	0.005mm	Non-rotating

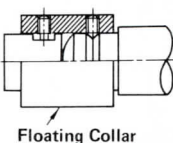
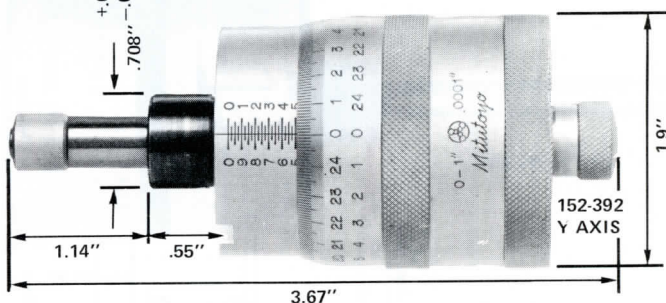
STRAIGHT HOLE FOR
SPINDLE CLAMP,
.216" DIA.

152-391
X AXIS



+ .0006
- .0002

152-392
Y AXIS



MICROMETER HEADS

Series 152

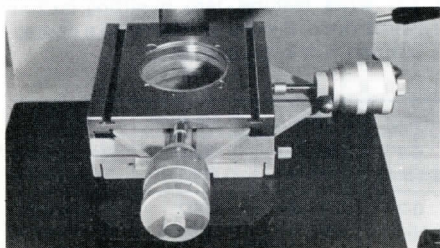
Specially designed micrometer head for X-Y micrometer stage use.

A floating collar attached on the spindle tip creates non-rotating spindle effect.

The part of the thimble where graduations are engraved rotates a full 360 degrees irrespective to the spindle position, thus providing easy zero-adjustment.

APPLICATION EXAMPLE

2x2" TRAVEL MICROSTAGE

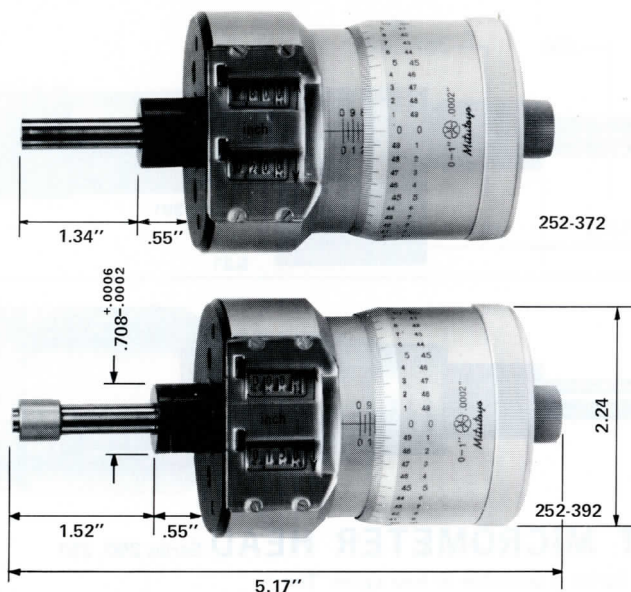


The graduation numerals are marked in plus and minus direction, and are color-coded in red and black.

Note Y axis head has numerals in Y axis direction. Black oxide shank has a hole where spindle lock can be installed if desired.

- Reads directly to .0001" or .001mm.
- With floating collar attached on the spindle tip.
- Quick zero-adjustment featured.
- Graduations indicated in both directions.
- Designed for microstage application.

Range	No.	Graduation	Description
0-1"	152-391	.0001"	for X axis
0-1"	152-392	.0001"	for Y axis
0-25mm	152-389	0.005mm	for X axis
0-25mm	152-390	0.005mm	for Y axis



DIGIT MICROMETER HEAD WITH DUAL DIRECTIONAL COUNTER

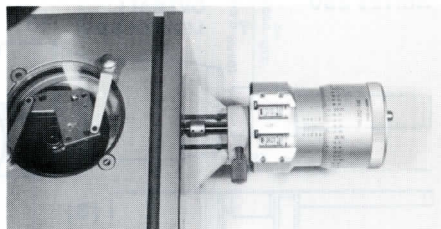
Series 252

Dual directional, color coded digit micrometer head allows trouble free micrometer readings. The new digit mike head features a double digital counter which indicates to one thousandth of an inch, or one hundredth of a millimeter for Metric models.

A zero resetting button is located by each counter, and operates irrespective to the position of the micrometer head.

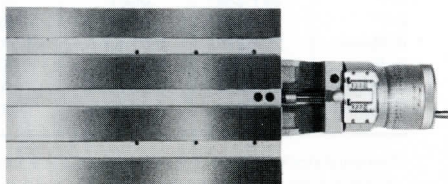
The smallest reading is .0002" or 0.005mm read directly from the thimble.

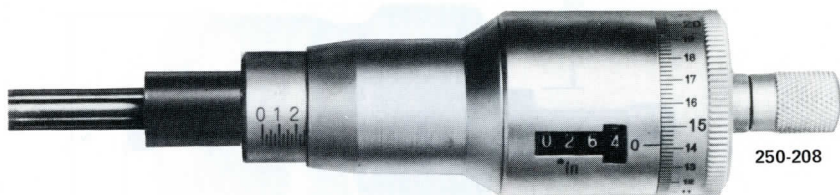
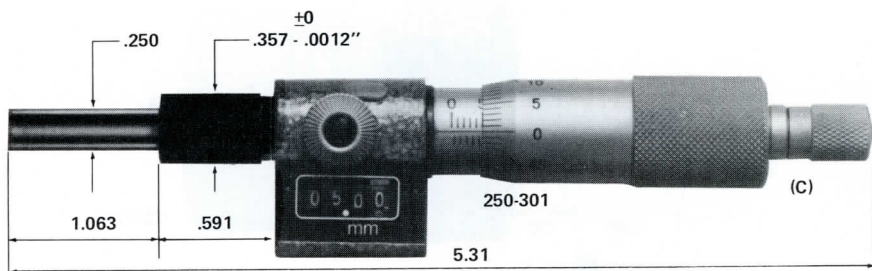
**6" TRAVEL MICROSTAGE
WITH DOUBLE COUNTER
MIKE HEAD 252-392**



A pair of double counter micrometer heads No. 252-392 are employed in 2x2" microstage. Reading X-Y axis together is now much easier because of the dual directional color coded counter.

Range	No.	Graduation	Spindle
0-1"	252-372	.0002"	Flat
0-1"	252-392	.0002"	w/Collar
0-25mm	252-348	0.005mm	Flat
0-25mm	252-390	0.005mm	w/Collar

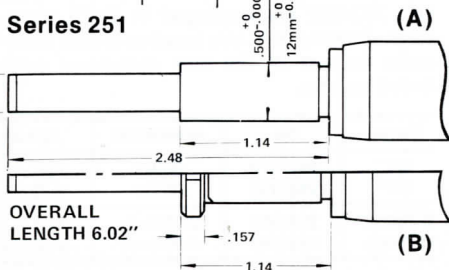
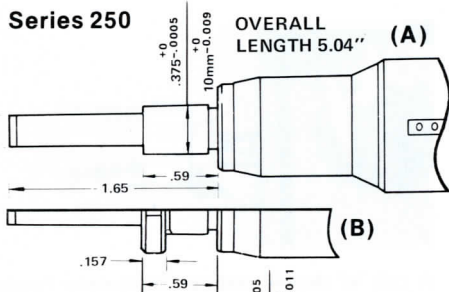




DIGIT MICROMETER HEAD Series 250, 251

The 250 Series is available in two types. The larger thimble mike head in which the counter is installed (lower photo shown above) has a larger version called 251 Series.

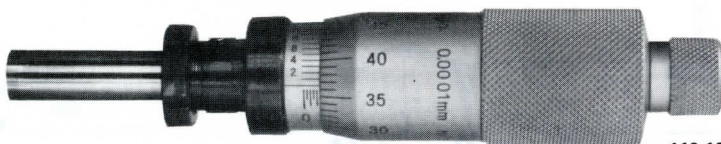
All spindles are featured with carbide faces.



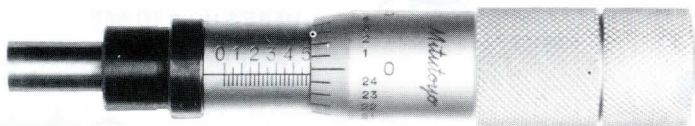
Range	No.	Graduation	Type
250 Series			
0-1"	250-312*	.0001"	(C)
0-25mm	250-301*	0.01mm	(C)
0-1"	250-208	.0002"	(A)
0-1"	250-207	.0002"	(B)
0-1"	250-206*	.0001"	(A)
0-1"	250-205*	.0001"	(B)
0-25mm	250-192	0.01mm	(A)
0-25mm	250-191	0.01mm	(B)
0-25mm	250-190	0.001mm	(A)
0-25mm	250-189	0.001mm	(B)

251 Series			
0-1"	251-240	.0002"	(A)
0-1"	251-239	.0002"	(B)
0-1"	251-238*	.0001"	(A)
0-1"	251-237*	.0001"	(B)
0-25mm	251-224	0.01mm	(A)
0-25mm	251-223	0.01mm	(B)
0-25mm	251-222	0.001mm	(A)
0-25mm	251-221	0.001mm	(B)

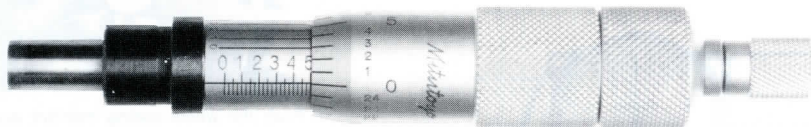
*Standard stocked items. We recommend these items first but other items listed above are also available.



110-102



153-207

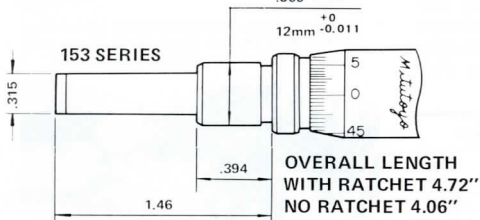
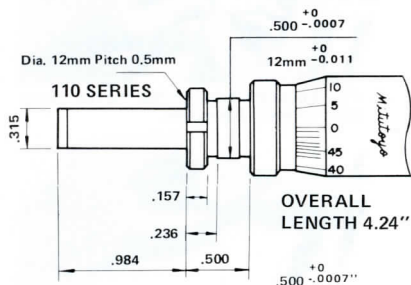


153-201

DIFFERENTIAL SCREW TRANSLATER

Series 110

110 Series for microscopic linear movements. Resolution 50 or 5 millionths inch. 153 Series features non-rotating spindle movements.



NON-ROTATING MICROMETER

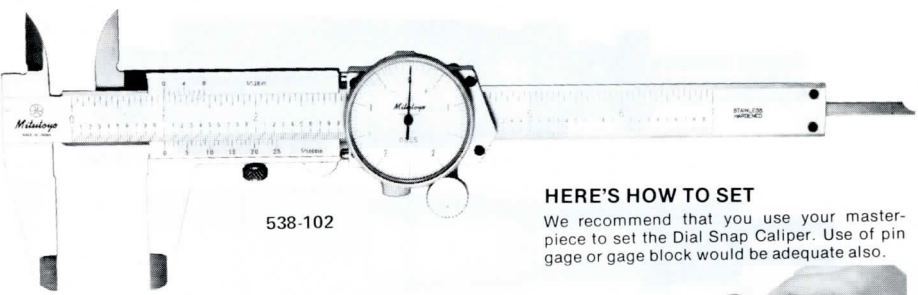
Series 153

Both 110 and 153 series are featured with carbide measuring faces.

Range	No.	Graduation	Note
110 Series			
0-.050"	110-111*	.000050"	
0-.050"	110-112*	.000005"	
0-2.5mm	110-101	0.001mm	
0-2.5mm	110-102	0.0001mm	
153 Series			
0-1"	153-207	.001"	
0-1"	153-205	.001"	w/Ratchet
0-1"	153-208	.0001"	
0-1"	153-206*	.0001"	w/Ratchet
0-25mm	153-203	0.01mm	
0-25mm	153-201*	0.01mm	w/Ratchet
0-25mm	153-204	0.001mm	
0-25mm	153-202	0.001mm	w/Ratchet

*Standard item. We suggest standard items first, but other items listed above are also available.

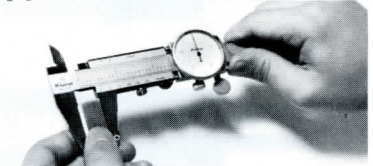
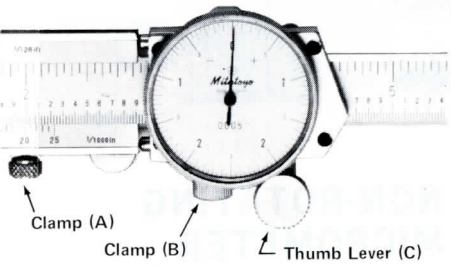
All micrometer heads shown above feature non-rotating spindle.



538-102

HERE'S HOW TO SET

We recommend that you use your masterpiece to set the Dial Snap Caliper. Use of pin gage or gage block would be adequate also.



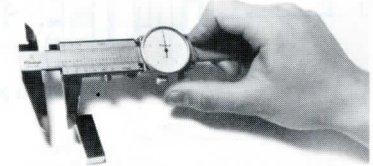
1. Push the whole sliding member against your masterpiece (in this instance gage block) and lock with clamp A.



2. Bring the dial indicator head to zero position using thumb lever C and lock with clamp B.



3. Fine adjust the bezel so that the indicating hand points to 0 position.



4. Release clamp A and retract the jaws about 1/16" using thumb lever C. You are now ready for go/no-go product segregation.

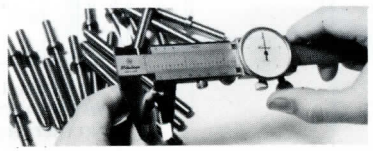
DIAL SNAP CALIPER

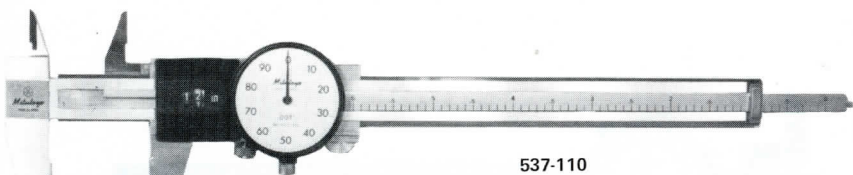
Series 538

This new spring-loaded caliper serves either as a conventional vernier caliper, or, as a go/no-go gage. It features a special gear-train, spring-loaded, dial-indicator attachment which takes it out of the conventional dial caliper family. The balanced dial indicator provides a plus and minus .025" range, with .0005" graduations.

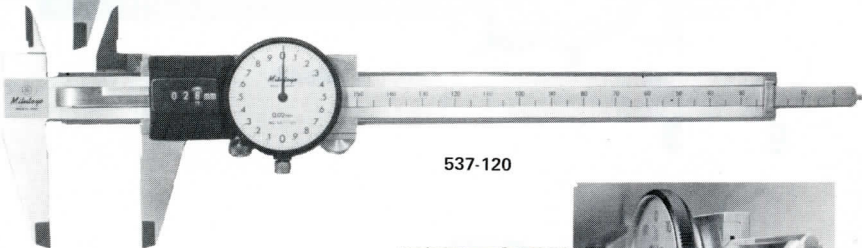
When used as a go/no-go gage, the jaws of the caliper are, first, closed and locked on the masterpiece, and, the dial indicator set to a zero reading. Then, thumb lever (C) on the special attachment makes it possible to open the jaws about 1/16" against the spring loading. As the jaws are released, the spring force closes them on the workpiece, and, the gear train conveys their movement to the dial indicator. The spring loading assures consistent measuring force, and, deviations from the dimensions of the masterpiece are read on the dial indicator.

Range		No.	Graduation	
Vernier	Dial		Vernier	Dial
4"	$\pm .025''$	538-102	1/128"	.0005"





537-110



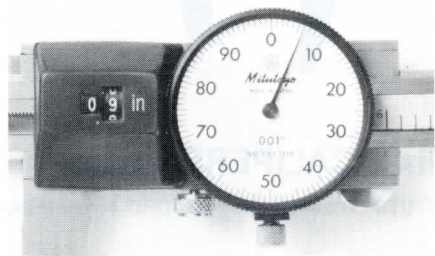
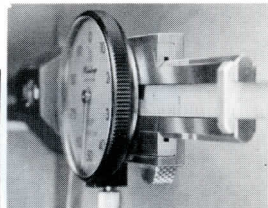
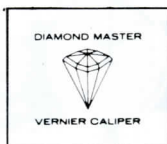
537-120

DIGIT DIAL CALIPERS

Series 537

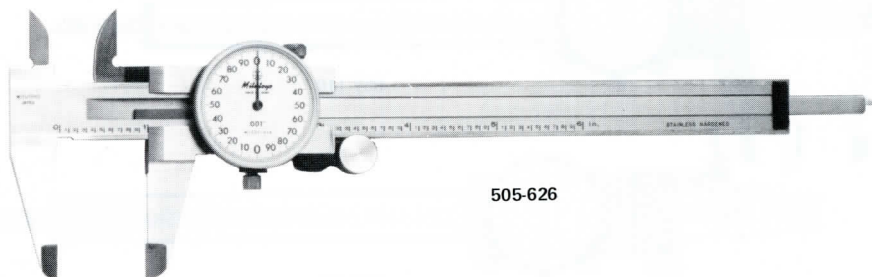
MITUTOYO introduces a whole new measuring instrument called "Digit Dial Caliper". The new caliper is featured with several technical improvements. The most noticeable feature is obviously the digital counter located by the dial face. There are however, other features equally significant:

- 1) New, hardened stainless steel rack bonded on the main beam (replaceable).
- 2) Widely separated, easy to read .001" dial graduations. One revolution of the dial hand coincides with the last digit on the counter.
- 3) Diamond (cross section) shaped main beam. This design allows snugly fit sliding jaws, and eliminates unnecessary jaw play.
- 4) Quadri, 4-way measurements.
Measures outside, inside, depth and step dimensions.

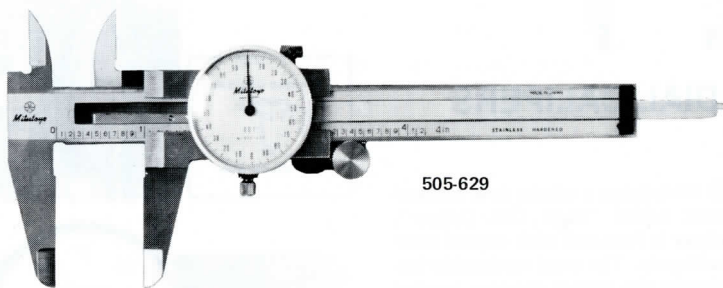


- 5) Patented rack cover. On the patented rack cover, one hundred thousandth graduations are engraved to occasionally verify the digital reading on the counter.
- 6) The black box located by the dial houses a complete independent mechanism which generates two digits. One is in inches, the other is one tenth of an inch. In the case of Metric 3, digits in millimeters are registered.

	Range	No.	Digit	Dial	Remarks
INCH	0-6"	537-110	0.0-6.0"	.001"	with .100" per revolution dial face
METRIC	0-150mm	537-120	000-150mm	0.02mm	with 2mm per revolution dial face



505-626

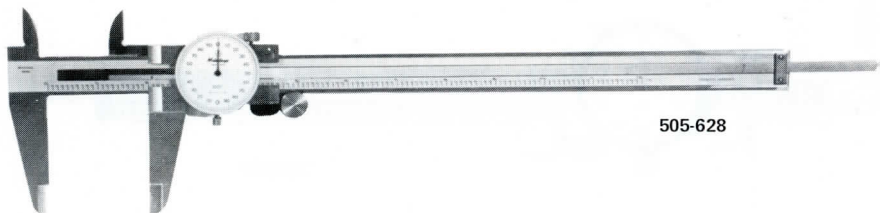


505-629

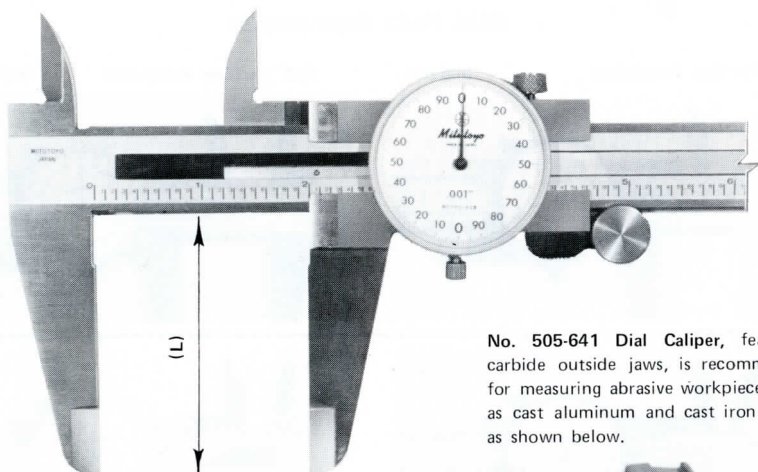
DIAL CALIPERS Series 505

MITUTOYO's exclusive "QUADRI" 4-Way Measuring Feature

- Outside, inside depth and step measurements. You get the "Quadri" feature on all dial calipers.
- Stainless steel hardened throughout with measuring faces precision ground and micro-lapped for ultimate accuracy.
- Scale surface: satin chrome finished with clear, crisp engraved graduations in inches and millimeters.
- Accuracy .001" per 6"
- Series 505 has thumb roll for fast adjustment.
- Series 504 has adjusting slide for fine adjustment.
- Covered rack for longer life and dust free operation on all dial calipers.
- Easily used, accurate — read directly to .001" on large clear dial.
- Easily read.
- Dial reads directly to .001" and is adjustable for setting.
- Clamp for repetitive settings.
- Raised sliding surface prevents defacement and wear of graduations: clear black engravings.
- Complete with fitted carrying case.



505-628

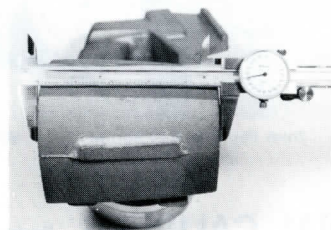


No. 505-641 Dial Caliper, featuring carbide outside jaws, is recommended for measuring abrasive workpieces such as cast aluminum and cast iron pieces as shown below.

DIAL CALIPERS Series 505

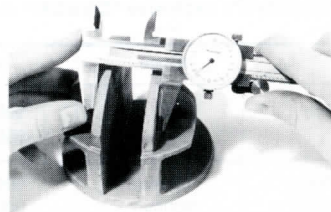
with MITUTOYO's exclusive

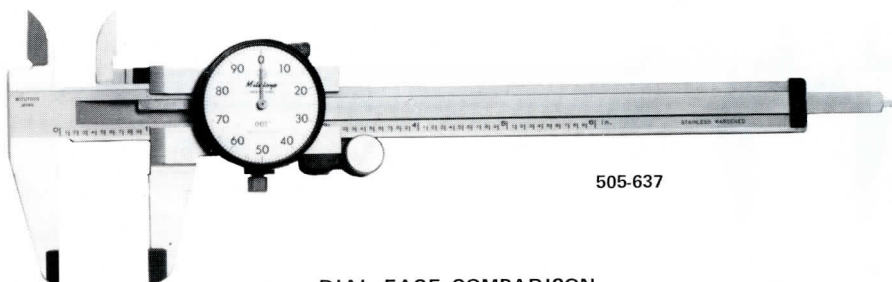
"Quadri" 4-Way Measurement feature.



Range	No.	Graduation	Jaw Length (L)
4"	505-629	.001"	1-9/16"
6"	505-626	.001"	1-9/16"
6"	505-641*	.001"	1-9/16"
8"	505-627	.001"	1-15/16"
12"	505-628	.001"	2-1/2"

* with Carbide Outside Jaws





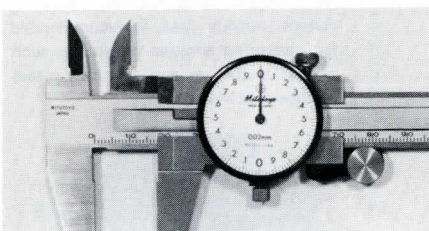
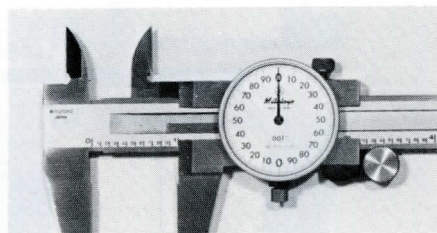
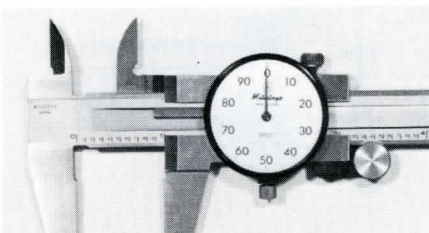
505-637

DIAL FACE COMPARISON**.100" Per One Revolution**

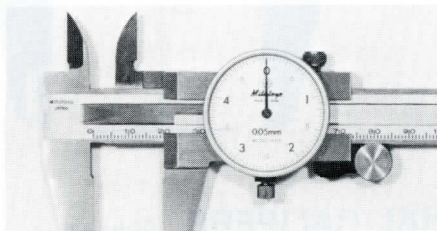
505-637

.200" Per One Revolution

505-626

**2mm Per One Revolution**

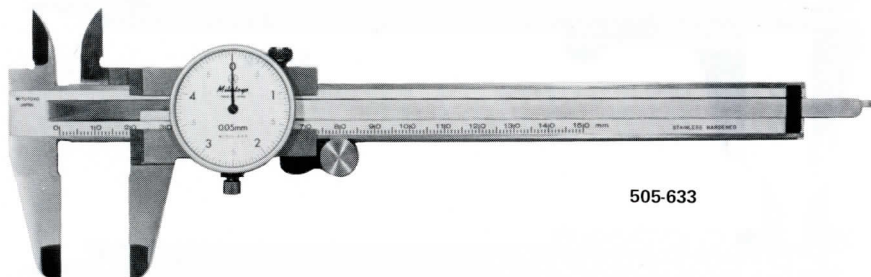
505-646

**5mm Per One Revolution**

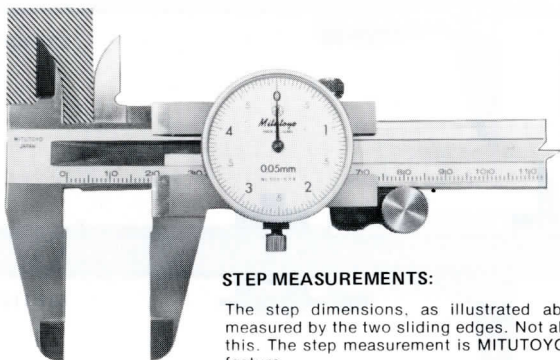
505-633

DIAL CALIPERS Series 505**MITUTOYO's exclusive "QUADRI" 4-Way Measuring Feature**

	Range	No.	Graduation	Remarks
Inch	6"	505-637	.001"	.100" per one revolution of dial hand
	8"	505-644	.001"	.100" per one revolution of dial hand
Metric	150mm	505-646	0.02mm	2mm per one revolution of dial hand
	200mm	505-647	0.02mm	2mm per one revolution of dial hand



505-633

**STEP MEASUREMENTS:**

The step dimensions, as illustrated above can be measured by the two sliding edges. Not all calipers do this. The step measurement is MITUTOYO's exclusive feature.

METRIC DIAL CALIPERS

Series 505

with MITUTOYO's exclusive

"QUADRI" 4-Way Measuring feature

Four ranges of Metric Dial Calipers are available from MITUTOYO. All of them measure four ways: inside, outside, depth and from an edge to a step with the moving jaw. Except the shortest 100mm range, all main beam scales are satin-chrome finished to provide glare-free readings.

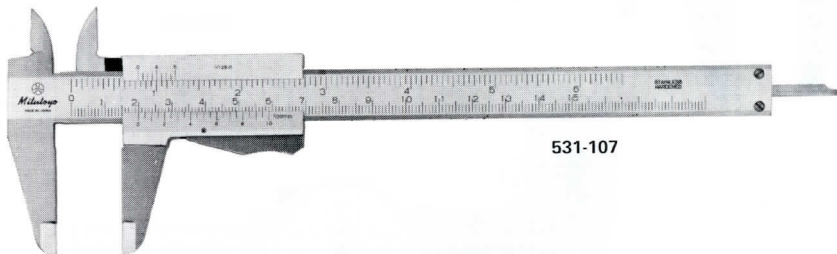
The rack on the main beam is covered by an ingenious patented rack cover which keeps the rack in best working order. The movable Slider/Jaw has a positive locking clamp.

- Bezel ring of dial indicator is fully adjustable, and held in position by a locking nut.
- Made of high-grade stainless steel.
- Reads to 0.05mm precisely and faster than vernier calipers.
- 0-100mm to 0-300mm in four ranges, choose the best-suited caliper.
- Complete with fitted carrying case.

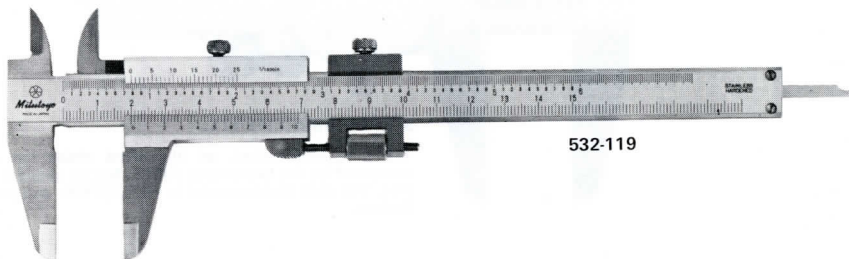
Range	No.	Graduation
0 - 100mm	505-636	0.05mm
0 - 150mm	505-633	0.05mm
0 - 200mm	505-634	0.05mm
0 - 300mm	505-635	0.05mm



530-312



531-107



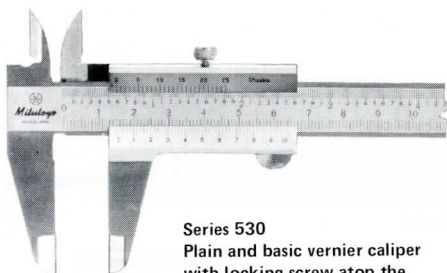
532-119

PRECISION VERNIER CALIPERS

The finest of Vernier Calipers for accurate work, with MITUTOYO'S exclusive "Quardri" 4-way measuring feature.

The MITUTOYO line of precision vernier instruments offers a wide range of precise tools for measuring accurately in thousandths of an inch. These include Vernier Calipers and Vernier Height gages, in both the English and Metric Measure. ALL MITUTOYO instruments are precisely made of the best quality hardened stainless steel throughout, to insure long life and continuous precision.

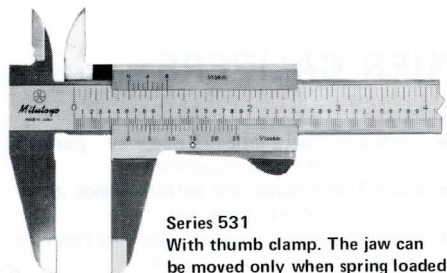
- Graduations photo engraved from a glass master plate for ultimate accuracy.
- Made of fully hardened stainless steel throughout.
- Satin-chrome finish.
- Raised sliding surfaces prevent defacement and wear of the graduations; clear black engravings.
- All measuring surfaces are ground and lapped for extreme accuracy.
- Jaws designed for outside, inside and step measurements.
- All calipers are supplied in a fitted case.



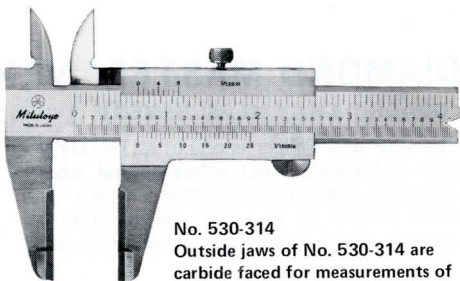
Series 530
Plain and basic vernier caliper
with locking screw atop the
moving slider



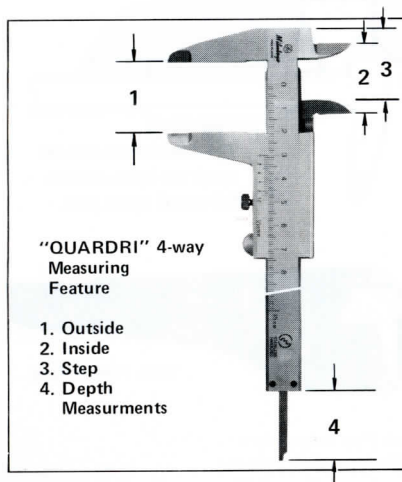
Series 532
With fine-adjustment for precise
measurement



Series 531
With thumb clamp. The jaw can
be moved only when spring loaded
thumb clamp is depressed.



No. 530-314
Outside jaws of No. 530-314 are
carbide faced for measurements of
abrasive products.

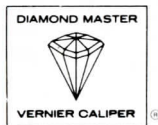
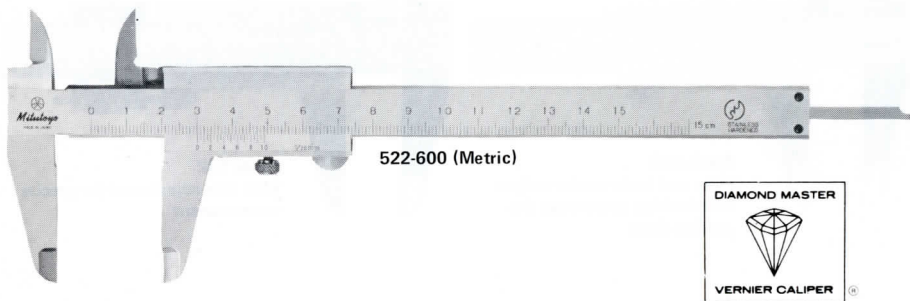


**"QUARDRI" 4-way
Measuring
Feature**

1. Outside
 2. Inside
 3. Step
 4. Depth
- Measurements

	No.	Range	Vernier Scale
SERIES 530	530-101	150mm	.05mm
	530-105	6"	1/128" x .001"
	530-116	8"	1/128" x .001"
	530-118	8" x 200mm	.001" x 0.02mm
	530-312	6" x 150mm	.001" x 0.02mm
	530-314*	6"	1/128" x .001"
SERIES 531	531-107	6" x 150mm	1/128" x 0.05mm
	531-108	8" x 200mm	1/128" x 0.05mm
	531-113	6"	1/128" x .001"
	531-114	8"	1/128" x .001"
	531-128	6" x 150mm	.001" x 0.02mm
	531-129	8" x 200mm	.001" x 0.02mm
SERIES 532	532-104	5"	1/128" x .001"
	532-105	7"	1/128" x .001"
	532-106	11"	1/128" x .001"
	532-119	5" x 130mm	.001" x 0.02mm
	532-120	7" x 180mm	.001" x 0.02mm
	532-121	11" x 280mm	.001" x 0.02mm

* With Carbide Outside Jaws.



DIAMOND MASTER® VERNIER CALIPERS Series 522

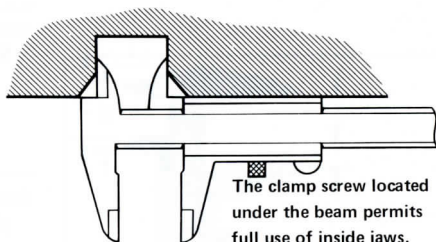
"QUADRI" 4-WAY MEASUREMENT

The Diamond Caliper is one of MITUTOYO's new instruments, and offers several advantages over conventional Vernier Calipers. The cross section of the main beam forms an octagon, as illustrated on the following page.

This unique patented beam design allows; (1) flush reading vernier scale in very simple form, and (2) smoother Slider/Jaw movement without excessive play.

The Diamond Caliper is made of high grade stainless steel and hardened for long-lasting tool life. The main scale and vernier scale are satin chrome finished for glare-free readings. Photo engraved scales offer crisp, clear graduations.

- Exclusive prismatic guide-way permits smooth Slider/Jaw movement.
- Flush-fitted main and vernier scales eliminate parallax reading errors.
- Locking screw is located under the beam to permit full use of inside Jaws.
- Measures inside, outside, depth and from an edge to a step with the moving Jaw.
- Complete with fitted carrying case.



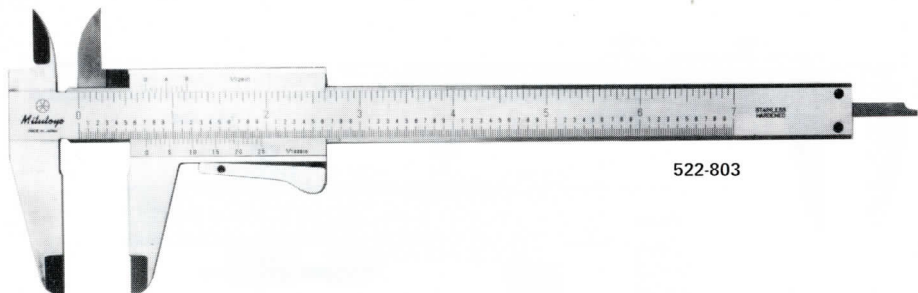
METRIC

Range	No.	Graduation
150mm	522-600	0.05mm
130mm x 5"	522-701*	0.05mm x 1/128"
130mm x 5"	522-702*	0.02mm x .001"
150mm x 6"	522-601	0.05mm x 1/128"
150mm x 6"	522-602	0.02mm x .001"
150mm x 6"	522-801**	0.05mm x 1/128"
150mm x 6"	522-802**	0.02mm x .001"



With Holster Case.

- *With Fine Adjustment
**With Automatic Stopper



522-803



522-501 (Metric)

GRADUATIONS ON MAIN
BEAM IN MILLIMETERS

DIAMOND MASTER



VERNIER CALIPER

DIAMOND MASTER VERNIER CALIPERS

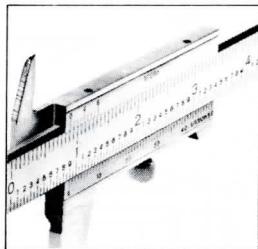
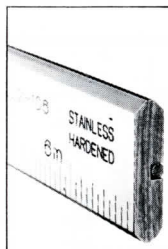
The 522 series vernier calipers feature a diamond-shaped main beam cross section. This unique construction allows the slider/vernier scale to fit flush with the main scale and slide on four planes. The result is a higher degree of accuracy and smoother slide movement.

New Metric Vernier Caliper (522-501)

The main beam graduations on this particular unit are engraved in millimeters. Note: unlike other metric models, the main beam is marked with 0—10—20—30, instead of 0—1—2—3 which is in centimeters. For those who are about to convert to metric systems, this unit, with strict millimeter scales, will be very helpful.

Inside and outside dimensions are taken from outside jaws. The nib thickness is 10mm.

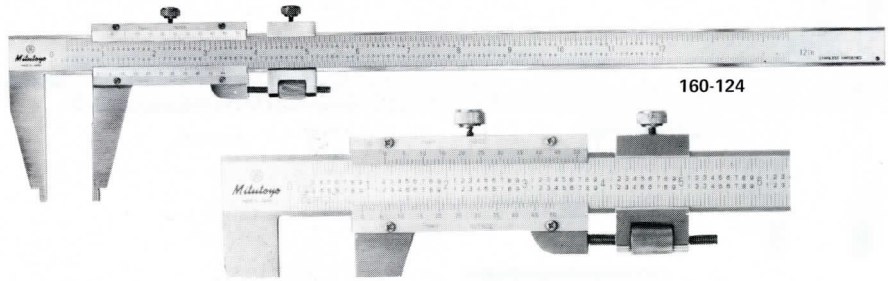
Outside measurements are read to 0.02mm with vernier scale. Inside dimensions are to 0.05mm.



Range	No.	Graduation
5"	522-703	1/128" x .001" with fine adjustment
6"	522-603	1/128" x .001"
6"	522-803	1/128" x .001" with automatic stopper

NEW TYPE (See Lower Photo)

100mm	522-501	0.05 x 0.02mm (millimeter unit)
4"	522-502	.001" x .001"

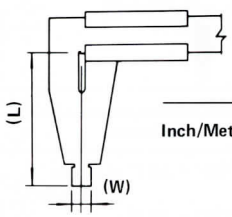


Widely spaced 50-division vernier scales and with fine-adjustment feature

VERNIER CALIPERS, Heavy Duty Series 160

All MITUTOYO Vernier Calipers meet or exceed Federal specifications for accuracy.

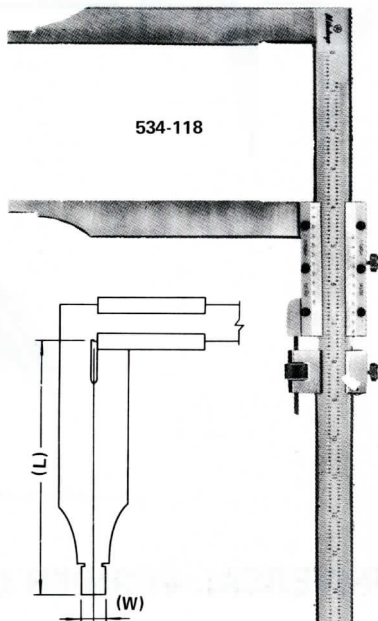
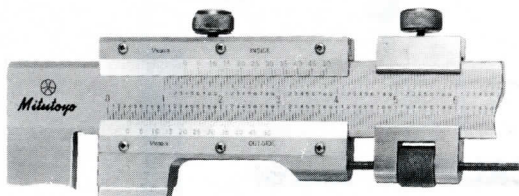
- Machine divided and engraved from master for extreme accuracy.
- Open-face designing permits both vernier scales to be located on one side of the gage for inside and outside measurements. No need to turn the tool over.
- Made of hardened stainless steel throughout, ground and lapped for accuracy.
- Satin-chrome finished on models up to 40".
- Raised sliding surface prevents defacement and wear of graduations.
- Long 50-division vernier scales have wide-spaced, easy-to-read, clear, crisp graduations on satin-chrome finish.
- Easy wear adjustment of vernier scales.
- Longer jaws permit greater accessibility and simpler measurements of larger work-pieces.
- Complete with fitted carrying case.



	Range	No.	Graduation	Depth of Jaw (L)	Max. Nib Width (W)
Inch	12"	160-124	.001"	3"	.300"
	18"	160-116	.001"	4"	.500"
	24"	160-102	.001"	4"	.500"
	40"	160-105	.001"	5-1/2"	1"
	60"	160-111	.001"	7"	1"
	80"	160-114	.001"	7"	1"
Inch/Metric	12" x 300mm	160-125	.001" x 0.02mm	3"	.300"
	18" x 450mm	160-119	.001" x 0.02mm	4"	.500"
	24" x 600mm	160-103	.001" x 0.02mm	4"	.500"
	40" x 1000mm	160-106	.001" x 0.02mm	5-1/2"	1"
	60" x 1500mm	160-112	.001" x 0.02mm	7"	1"
Metric	300mm	160-127	0.02mm	75mm	9.5mm
	450mm	160-128	0.02mm	100mm	14.5mm
	600mm	160-101	0.02mm	100mm	14.5mm
	1000mm	160-104	0.02mm	140mm	19.5mm
	1500mm	160-110	0.02mm	180mm	24.5mm

**VERNIER CALIPERS** Series 534**"LONG JAWS, HEAVY DUTY TYPE"**

- Made of fully hardened stainless steel throughout.
- Scale surface is satin-chrome finished.
- Raised sliding surface prevents defacement and wear of clear, black engraved graduations.
- All measuring faces are ground and lapped for ultimate accuracy.
- Extra long jaws permit greater accessibility and simpler measurement of large workpieces.
- Equipped with adjustable slide for fine adjustment.
- Complete with fitted carrying case.
- Smallest reading .001" or 0.02mm.

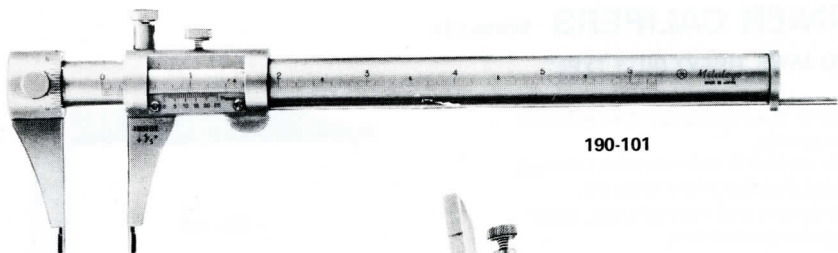


- Long 50-division vernier scales are widely spaced, easy to read and adjustable.

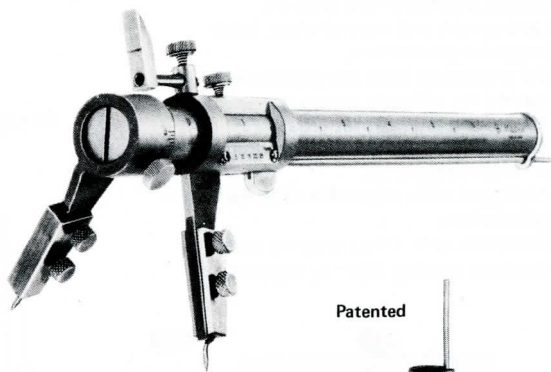
When the two outside jaws are closed, the nib width is smaller than the dimensions (W) listed below.

To measure the smallest measurable inside dimension, the jaws must be opened, leaving a space between the jaws.

	Range	No.	Graduation	Depth of Jaw (L)	Max. Nib Width (W)
INCH	12"	534-117	.001"	3.5"	.3"
	20"	534-118	.001"	7.8"	.8"
	30"	534-119	.001"	7.8"	.8"
	40"	534-120	.001"	7.8"	.8"
INCH/METRIC	12" x 300mm	534-105	.001" x 0.02mm	90mm	10mm
	20" x 500mm	534-106	.001" x 0.02mm	200mm	20mm
	30" x 750mm	534-107	.001" x 0.02mm	200mm	20mm
	40" x 1000mm	534-108	.001" x 0.02mm	200mm	20mm



190-101



Patented

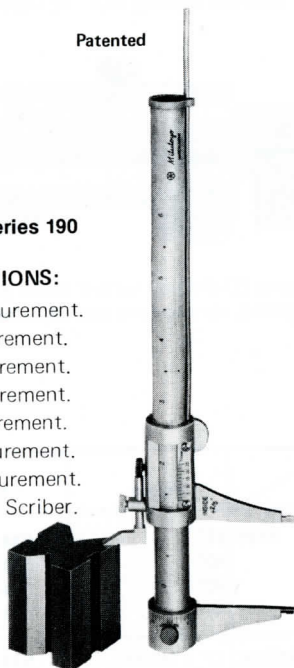
UNIVERSAL VERNIER CALIPER Series 190

THE NEWEST MULTI-USE TOOL FROM MITUTOYO

- Round main scale.
- Smooth movement.
- Made of special hardened steel.
- Satin-chrome finished on graduation portion.
- Measuring faces hardened, ground and micro-lapped for ultimate accuracy.
- Complete with divider, height gage attachment and fitted carrying case.
- Clear graduations on satin chrome finish.

8 APPLICATIONS:

- Outside measurement.
- Inside measurement.
- Depth measurement.
- Offset measurement.
- Angle measurement.
- Height measurement.
- Divider measurement.
- Compass and Scriber.



Range	No.	Graduation
0 - 6"	190-101	1/1000" x 90 degrees



VERNIER AND DIAL DEPTH GAGES

Series 527

Vernier Depth Gage

Ideal tool for locating shoulders, flanges, steps or depths of holes. The vernier depth gage is featured with extra-long 50 division vernier scale. In the event of depth beam wear, the vernier scale can be re-positioned. Fine adjusting slider locates the depth precisely.

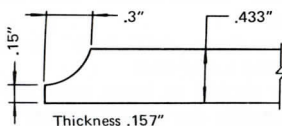
Dial Depth Gage

Dial reading convenience is added on the depth gage. It uses a rack and pinion mechanism similar to the dial caliper No. 505-626. One revolution of the dial hand indicates .200". One half revolution, .100", coincides with the smallest graduation on the depth beam.



Optional Extension Base 900367

MAIN BEAM DIMENSIONS

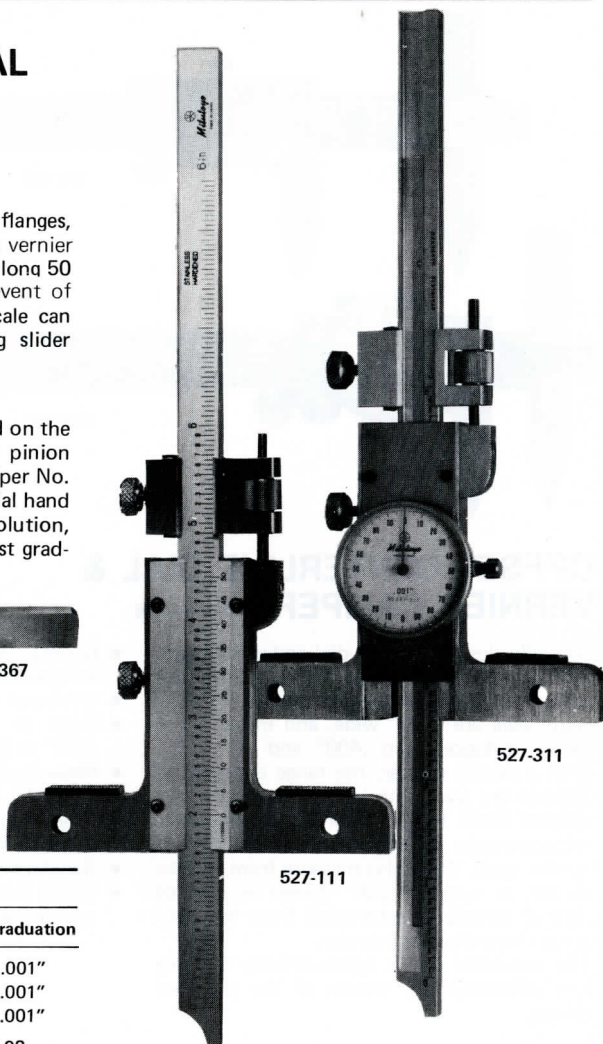


VERNIER DEPTH GAGE

Range	No.	Graduation
0 - 6"	527-111	.001"
0 - 8"	527-112	.001"
0 - 12"	527-113	.001"
0 - 150mm	527-101	0.02mm
0 - 200mm	527-102	0.02mm
0 - 300mm	527-103	0.02mm

DIAL DEPTH GAGE

Range	No.	Graduation
0 - 6"	527-311	.001"
0 - 12"	527-313	.001"
0 - 150mm	527-301	0.05mm
0 - 300mm	527-303	0.05mm

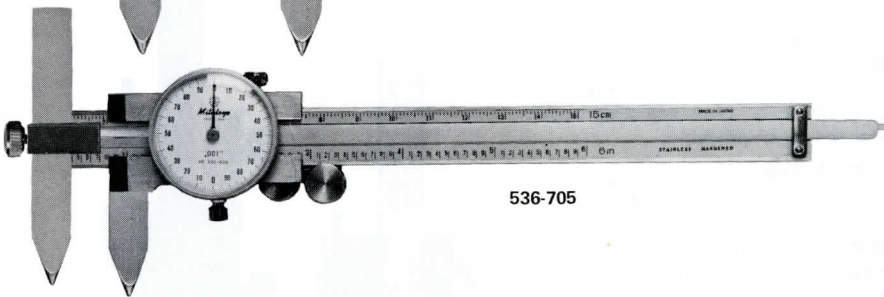


Standard base has a span of 4". If this is not long enough, longer additional base can be attached using two holes on the base.

Base Size (Optional Extension Base)	No.
7"	900367
10"	900368
12"	900369



536-405



536-705

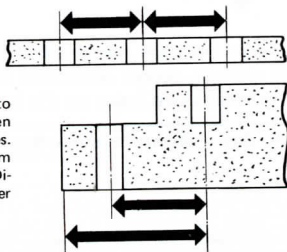
OFFSET CENTERLINE DIAL & VERNIER CALIPERS Series 536

Specially designed offset dial and vernier calipers are used for center distance measurements on the same and offset planes.

Both jaws are .400" wide, and measure the center distance from .400" and up to 6". With a metric vernier, the range is 10mm to 150mm the jaw width being 10mm each. All calipers listed here are for center to center measurements directly read off the dial or vernier scale. They also measure from edge to center. A sum of .200" (5mm in case of metric) should be subtracted from the measured dimensions in this case.

The moveable jaw is approximately 3" long and adjustable by means of the provided clamp.

- Direct reading center distance measurements in English or Metric.
- Choice of vernier or dial caliper.
- Edge to center measurements (subtract .200" or 5mm)
- Measuring range from .400" to 6" (from 10mm to 150mm for metric)
- Hole diameter should be larger than .06" (1.5mm) but smaller than .400" (10mm)
- Supplied with fitted carrying case.
- Depth bar and inside jaws are not available with these vernier calipers.



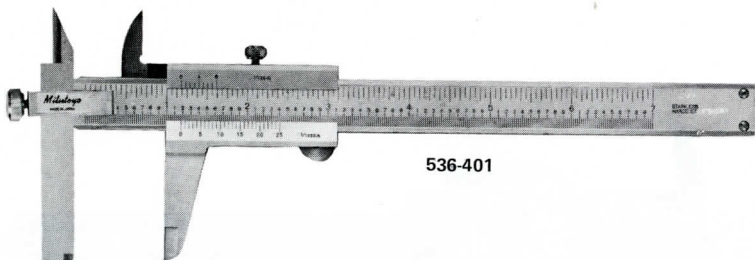
Measures center to center on the even and offset planes. Also measures from edge to center. Direct reading (center distances).

VERNIER CALIPER

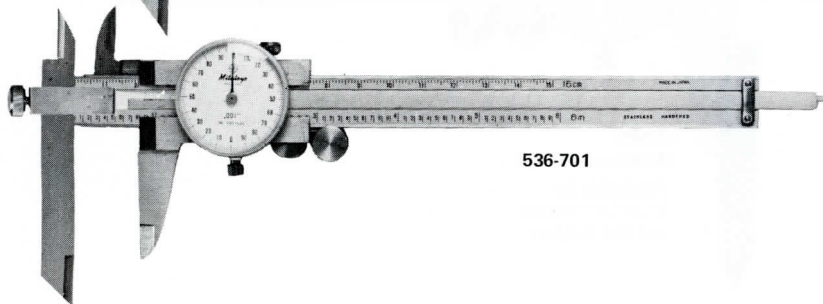
Range	No.	Graduation
.4" - 6"	536-405	1/128" x .001"
10 - 150mm	536-105	.05mm

DIAL CALIPER

.4" - 6"	536-705	.001"
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536-401



536-701

OFFSET DIAL & VERNIER CALIPERS Series 536

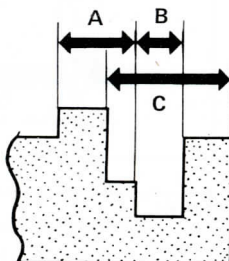
The special offset dial and vernier calipers with vertically adjustable jaws make it possible to measure dimensions on uneven planes such as the one illustrated below.

The total length of the movable jaw is 3-3/4", providing extra reach in vertical direction. Depth bar is the standard feature with this vernier caliper.

To measure the distance "C" (see drawing below) add .400" to the obtained reading, or 10mm in case of Metric

- .400" or 10mm wide adjustable jaw works wonders.
- Both Metric and English models available with depth bar featured.
- Satin-chrome finished main beam and vernier scale to insure crisp graduations.
- Reads to 1/128" - .001" or .05mm.
- Supplied with fitted carrying case.
- Considering the ease of operation, and high frequency of offset measurements, the offset vernier caliper is a well worth tool for all machinists.
- Made of stainless steel throughout.

Usually hard to get at dimensions such as distances A, B, C, can be accurately measured with offset vernier caliper.

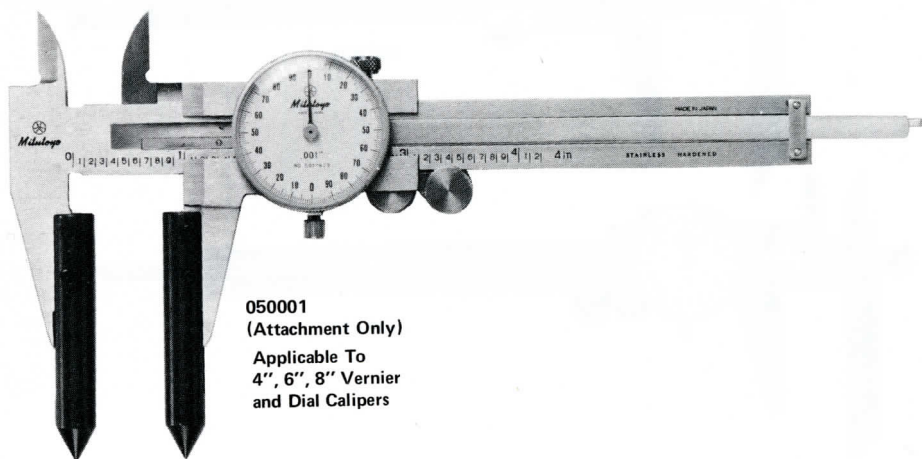


VERNIER CALIPER

Range	No.	Graduation
0 - 6"	536-401	1/128" x .001"
0 - 150mm	536-101	.05mm

DIAL CALIPER

0 - 6"	536-701	.001"
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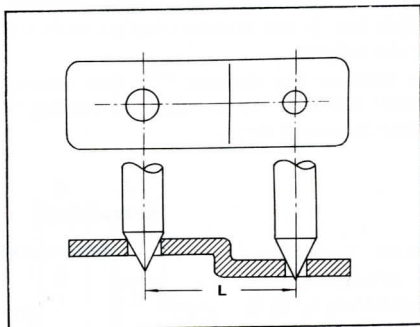
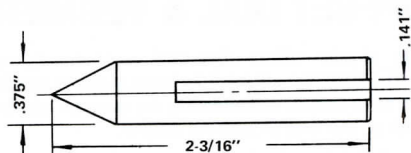
CENTERLINE GAGE

A pair of $3/8"$ dia. conical probes is specially designed for dial and vernier calipers to quickly measure centerline distances.

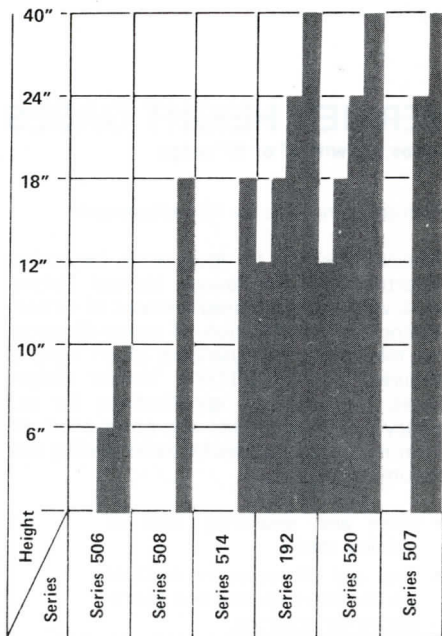
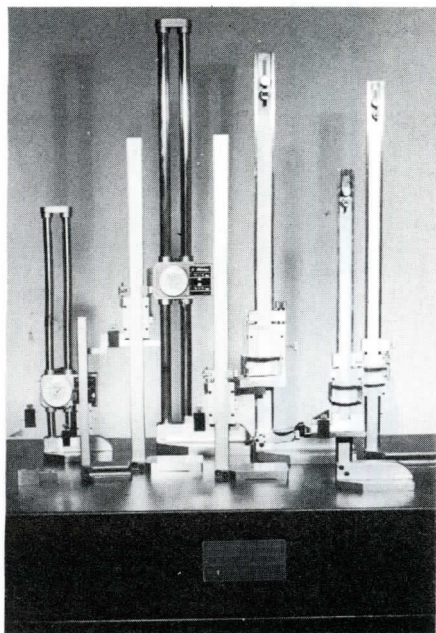
Due to the fact that the attachment is $3/8"$ in diameter, and that the conical points are $3/8"$ apart when closed, the centerline gage does not measure distances less than $3/8"$. However, since the caliper reads $3/8"$ when closed with the attachment installed, the centerline distance is directly read off the dial and vernier without a conversion factor.

Each probe has two small holding nuts, and the attachment is supplied with an Allen wrench. The probes are black oxide finished, and are quite durable for the required measurements.

The 60° conical probe snugly fits into the holes, and takes guess work away from center distance measurements.



Code No.	Description
050001	Center Line Gage



HEIGHT GAGE SELECTION GUIDE

Series 506

The smallest sized height gage group. With fine-adjustment and carbide tipped scriber. Inch only and inch/metric models.

Series 508

Lightweight (4 lbs. total) height gage. For automotive and other production plants. Primary use is for scribing and positioning.

Series 514

Two units, 18" only and 18"/450mm, with same specifications as featured in Series 520 except base is hammer-tone finished.

Series 192

Height gages with a double-directional digital counter. The zero point can be floated to any desired height within the range. Inch or metric models.

Series 520

Heavy-duty vernier height gage. Features fine-adjustable vernier and main scales. Satin-chrome finish throughout.

Series 507

Height gage with digital display unit. Rack and pinion driven disc encoder generates pulses for display. Resolution .0005", 0.01mm or both. See "Major Instruments" page 205.

NOTE: Also see Series 192 inch/metric Height Gage. with self-contained digital display. Page 206, 207.

VERNIER HEIGHT GAGES

Series 506 with 6" or 10" range

With adjusting slide for fine adjustment.

Specially designed for tool rooms, inspection departments — for layout, jig and fixture work where accurate measurement of vertical distance or the location of center-distances (to tolerance of thousandths of an inch) is required. All MITUTOYO Vernier Height Gages meet Federal specifications for accuracy. All graduations are photo-engraved from master glass plates for easier reading and maximum accuracy.

- Beam and measuring slide of stainless steel.
- Base and all measuring surfaces are hardened, ground and micro-lapped for accuracy.
- Clear, crisp black graduations on a satin-chrome finish for easy reading and each 0.1" is numbered.
- Right hand type for easy use.
- Raised sliding surfaces on main scale prevent defacement and wear of graduations.
- Fine adjustment for easy setting.
- Marker clamp also accepts Test Indicator Bars (No. 900306) readily.
- Carbide tipped offset scriber.

No. Description

900173 Scriber for 6" model

900258 Scriber for 10" model



	Range	No.	Vernier Scale	Base
INCH	6"	506-203	.001"	1.8" x 3.35"
	10"	506-206	.001"	2.35" x 4.0"
INCH/ METRIC	6" x 150mm	506-202	.001" x 0.02mm	1.8" x 3.35"
	10" x 250mm	506-205	.001" x 0.02mm	2.35" x 4.0"

SERIES 506 Gages are furnished without Case. For additional Wooden Case, see page 220.



VERNIER HEIGHT GAGES Series 520

With adjustable reference point extra long vernier scale and a big magnifier reading glass.

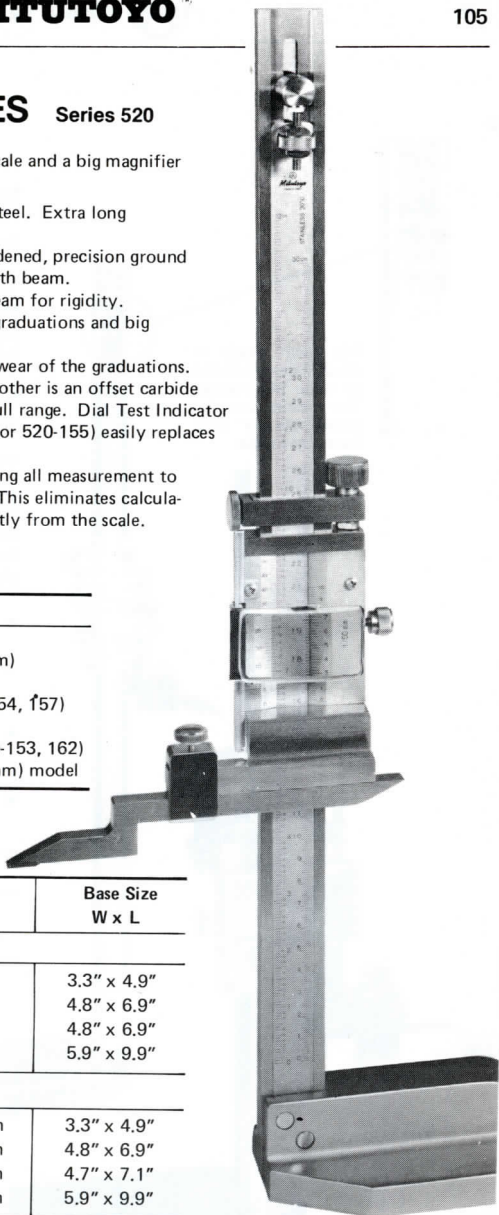
- Beam and measuring slide of hardened stainless steel. Extra long vernier scale.
- Base and all measuring surfaces are tool steel hardened, precision ground and micro-lapped for accuracy, and are square with beam.
- Extra heavy bases for stability, and extra large beam for rigidity.
- Gages are satin chromed finish, with clear black graduations and big magnifier reading glass for easy reading.
- Raised sliding surfaces of the main scale prevent wear of the graduations.
- Scriber is double ended. One end is straight, the other is an offset carbide tip which allows direct readings from base over full range. Dial Test Indicator with bar (No. 900306 for 520-152; No. 900209 for 520-155) easily replaces the scriber.
- Sliding scale can be adjusted up or down permitting all measurement to start from an even figure reference on the scale. This eliminates calculation. Accurate and exact readings are made directly from the scale.

No.	Scriber
900167	For 300mm (520-155, 520-149)
900282	For 18" (450mm) and 24" (600mm) models (520-150, 156-163)
900389	For 40" (1000mm) models (520-154, 157)
900172	For 12" model (520-152) only
900285	For 18" and 24" models only (520-153, 162)
413060	Fitted carrying case for 12" (300mm) model

Range	No.	Graduation	Base Size W x L
INCH			
12"	520-152	.001"	3.3" x 4.9"
18"	520-162	.001"	4.8" x 6.9"
24"	520-153	.001"	4.8" x 6.9"
40"	520-154	.001"	5.9" x 9.9"

INCH METRIC			
12" x 300mm	520-155	.001" x 0.02mm	3.3" x 4.9"
18" x 450mm	520-163	.001" x 0.02mm	4.8" x 6.9"
24" x 600mm	520-156	.001" x 0.02mm	4.7" x 7.1"
40" x 1000mm	520-157	.001" x 0.02mm	5.9" x 9.9"

METRIC			
300mm	520-149	0.02mm	85 x 125mm
600mm	520-150	0.02mm	120 x 180mm



SERIES 520 Gages are furnished without Case. For additional Wooden Case, see page 220.

VERNIER HEIGHT GAGES

Series 514

The Series 514 Vernier Height Gage is a sister model of the Series 520, which is shown on the following pages, and is almost identical in construction and dimension except the bottom base. The base finish of the Series 514, shown here, is a hammer-tone green baked enamel, while that of the Series 520 is satin-chrome.

The Series 514 Vernier Height Gage features adjustable main scale graduation as illustrated. Because of this fine-adjustable main scale, the zero-point of this height gage can be set at anywhere from zero to over 3/4" above the surface plate.

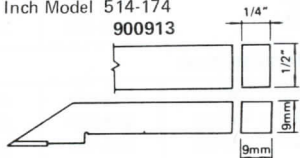
- Carbide-tipped scriber.
- Widely separated vernier scale and magnifier make reading easy and precise.
- Satin-chrome finished main scale and vernier plates.
- With fine-adjustment.

Range	No.	Graduation
18"	514-174	.001"
18" x 450mm	514-173	.001" x 0.02mm

Scribers:

For Inch Model 514-174

900913

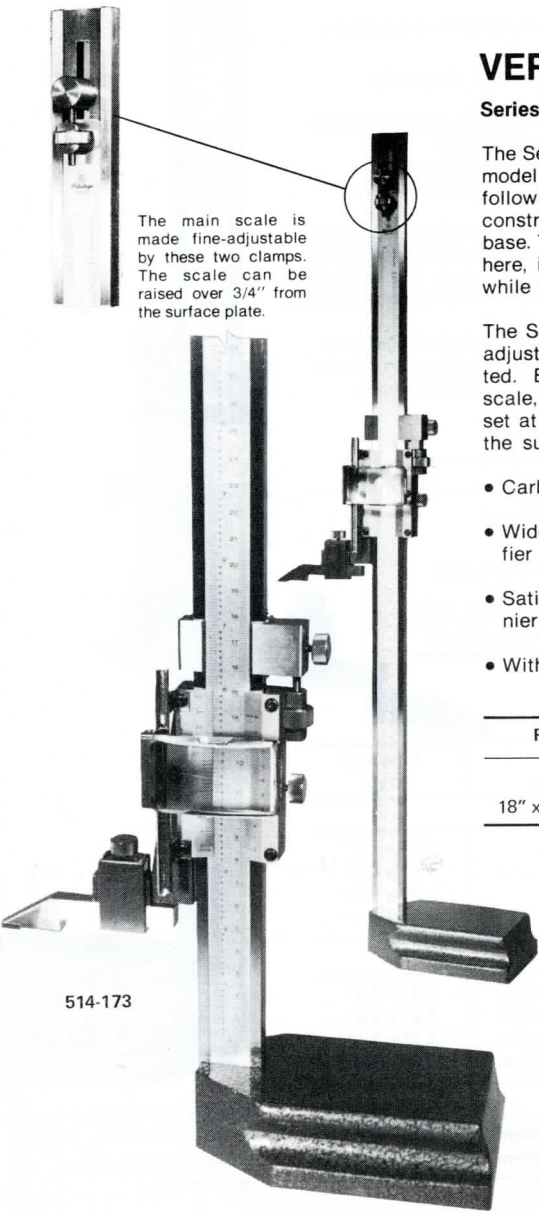


Carbide Tip

900168

For Inch/Metric Model 514-173

Carbide-tipped scriber is furnished with the tool. Note, inch model uses 1/4 x 1/2" stem, while metric uses 9 x 9mm stem.



The main scale is made fine-adjustable by these two clamps. The scale can be raised over 3/4" from the surface plate.

514-173



VERNIER HEIGHT GAGES Series 508

Extra Light Weight (4 lbs.) Type

The new Series 508 Vernier Height Gage is for layout and scribing work, as well as regular height measurements.

To facilitate ease of scribing in upright positions, horizontal and other awkward positions, the weight is limited to a mere 4 lbs. total. Two models, 18" only and 18" x 450mm, are available from MITUTOYO. Both models feature fine-adjustment and carbide tipped scriber. Main beam scale and vernier plates are satin-chrome finished for glare-free readings.

- Extra-light model, 4 Lbs. total.
- Carbide-tipped scriber.
- Satin-chrome finished scales.
- For scribing and layout work.

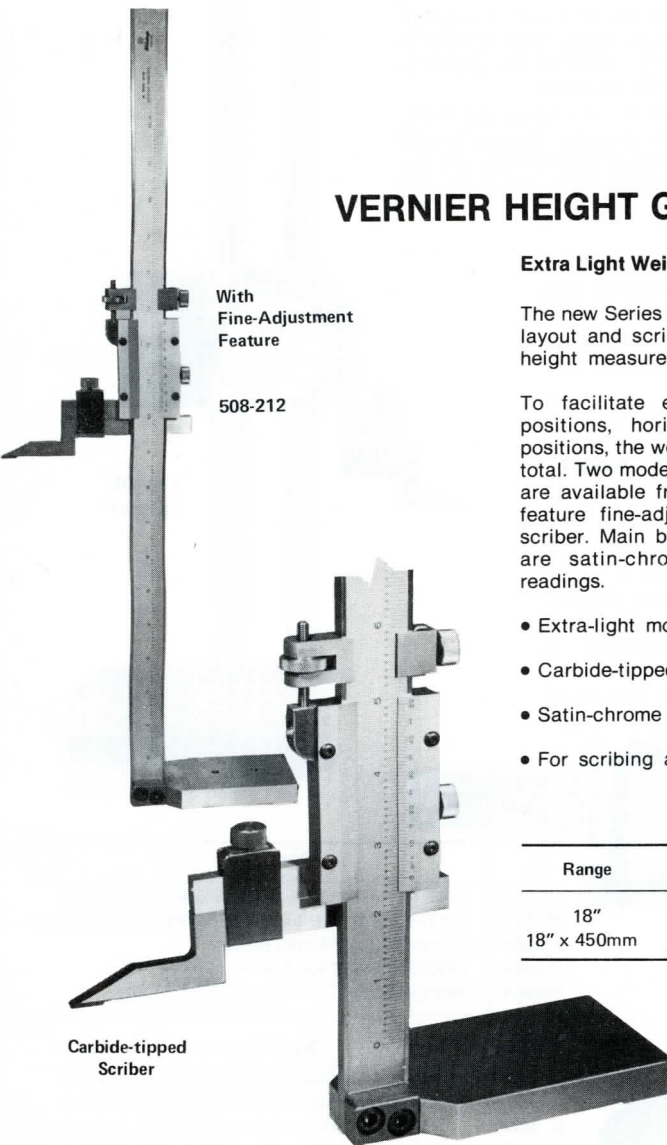
Range	No.	Graduation
18"	508-212	.001"
18" x 450mm	508-211	.001" x 0.02mm

An optional holder is available, which will be attached on the base plate.

With
Fine-Adjustment
Feature

508-212

Carbide-tipped
Scriber





"DIGIT COUNT-HITE"

HEIGHT GAGE with Digital Counter

The combination of large dial indicator and error-proof digital counter makes this unique height gage so easy to read to .01mm. 300mm, 450mm, 600mm and 1000mm models are now available from MITUTOYO.

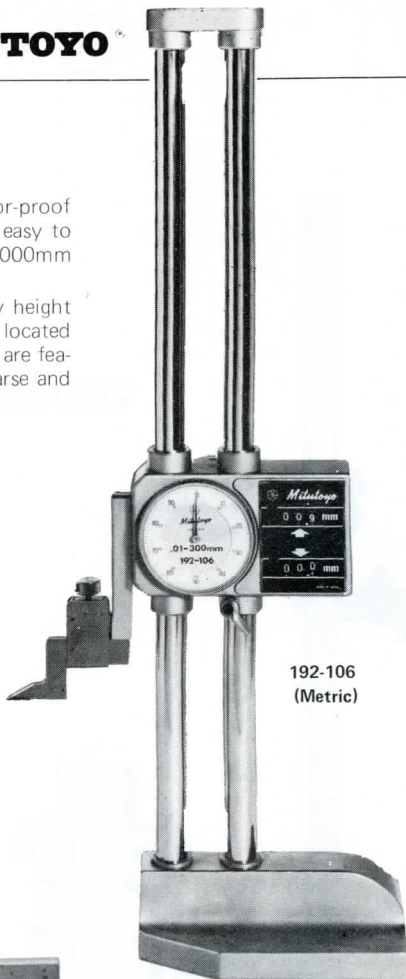
The double digital counter can be zero-set at any height within range by depressing the zero-reset button located by the individual counter. All "Digit Count-Hites" are featured with a large feed wheel which facilitates coarse and fine vertical adjustments.

- With carbide tipped Scriber.
- Chrome plated double seams.
- Error-proof Digital Counter comes with zero reset button.
- Bottom surface of the base is hardened ground and lapped for maximum flatness.
- With fine-adjusting wheel and lock.

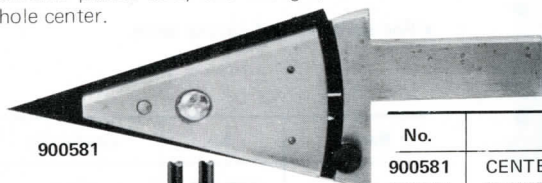
CENTER MASTER 900581

The center master locates the hole center as its triangle head is inserted in a hole.

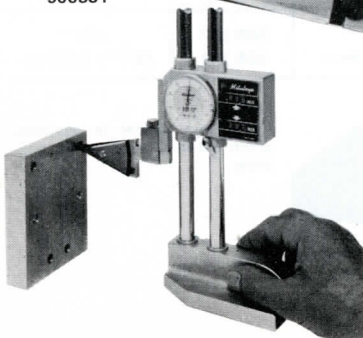
Locating another hole center with this attachment, while mounted on a height gage, with the distance between the two hole centers can be quickly established. Largest measurable hole diameter is approximately 1½". The stem dimension is 1/4"x1/2". The center master consists of chrome plated body and triangle, movable hole center.



192-106
(Metric)



900581



No.		Description		
900581		CENTER MASTER for Inch models (¼ x ½" stem)		
951144		CENTER MASTER for Metric models (9 x 9mm stem)		
900168		SCRIBER for all Metric models		
413060		WOODEN CASE for 300mm units.		
413061		WOODEN CASE for 450 and 600mm units.		

Range	No.	Digital Counter	Grad.
0 - 300mm	192-106	000mm (Dual Reading)	0.01mm
0 - 450mm	192-102	000mm (Dual Reading)	0.01mm
0 - 600mm	192-104	000mm (Dual Reading)	0.01mm
0 - 1000mm	192-105	000mm (Dual Reading)	0.01mm

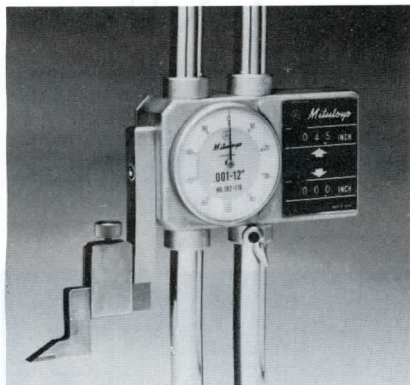
**"DIGIT COUNT-HITE" Series 192****HEIGHT GAGE with Dual-Directional DIGITAL COUNTER**

"Digit Count-Hites" are available either in Metric only, as described on the preceding page, or Inch only, as shown on this page.

All four models, 12", 18", 24" and 40" are furnished with double digital counter for quick and easy upward and downward readings.

The dual directional counter can be zero-set individually, and float zero-point anywhere within the range.

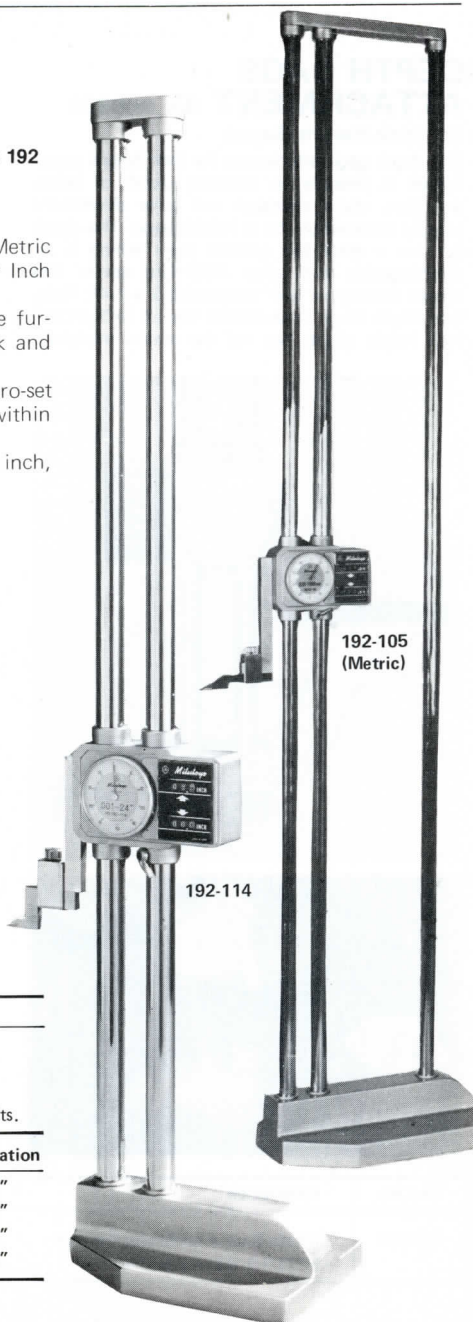
The last digit on the counter is in tenths of an inch, the dial face is graduated in thousandths.



Note: "Digit Count-Hite" is supplied without case. Please add the following fitted case if desired.

No.	Description
900581	CENTER MASTER.
900258	SCRIBER for all Inch models
413060	WOODEN CASE for 12" units
413061	WOODEN CASE for 18" and 24" units.

Range	No.	Digital Counter	Graduation
12"	192-116	00.1" (Dual Reading)	.001"
18"	192-112	00.1" (Dual Reading)	.001"
24"	192-114	00.1" (Dual Reading)	.001"
40"	192-115	00.1" (Dual Reading)	.001"

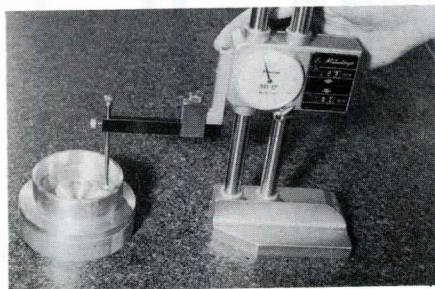
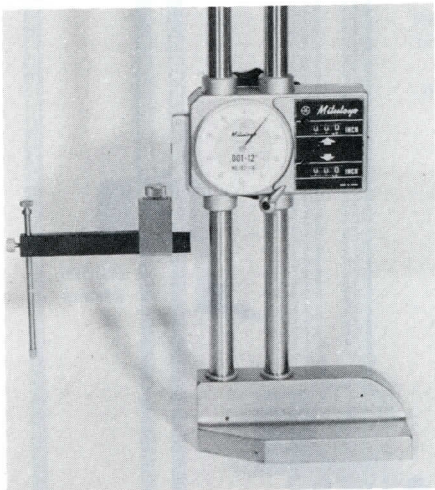




DEPTH GAGE ATTACHMENT No. 900878

For Inch Height Gages

The depth gage attachment for inch height gages makes it possible to measure depth of holes, shoulders, steps, recesses and other dimensions usually inaccessible by a height gage. The depth bar has a steel ball contact point which is interchangeable with other ADG type points. The square holding bar is 4" long and 1/2 x 1/4". Note, this Depth Gage Attachment fits all MITUTOYO inch height gages, but not the metric models.

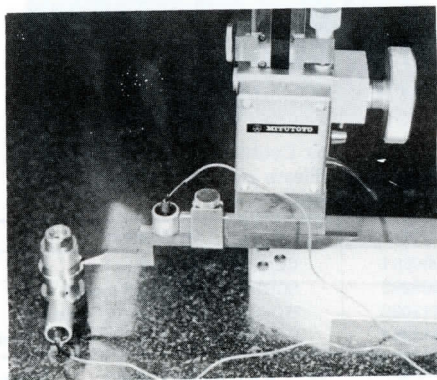
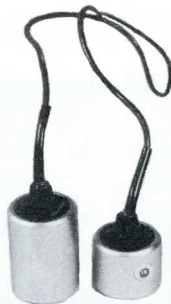


CONTACT SENSOR No. 900872

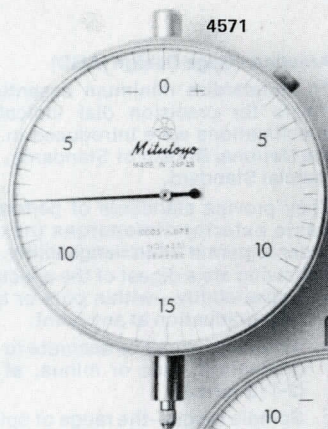
The Contact Sensor consists of a tiny battery cell, permanent magnets, and a red indicator which lights up when the scriber touches conductive workpieces.

The purpose of using this sensor is to eliminate a common tendency of jacking-up the height gage excessively while taking measurements.

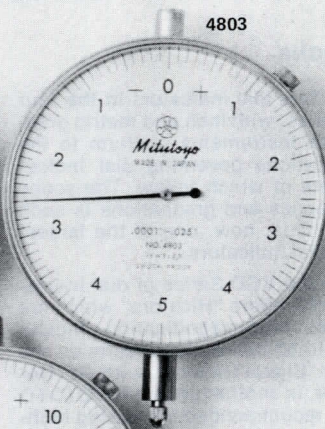
The Contact Sensor indicates when to read the measurements, and leaves no room for guessing or feeling the height gage. It upgrades the accuracy and brings consistency to height gage measurements. The battery cell replacement is available at most photo stores (mercury battery 2.6V).



Part No.	Description	Part No.	Description
900878	Depth Gage Attachment for Inch MITUTOYO Height Gages	900872	Contact Sensor for conductive workpieces

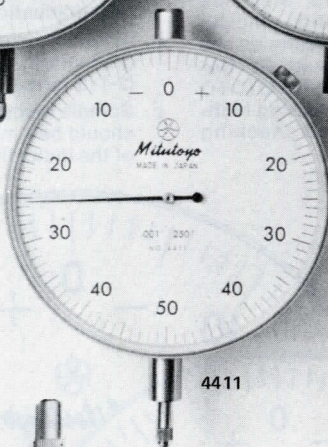


4571

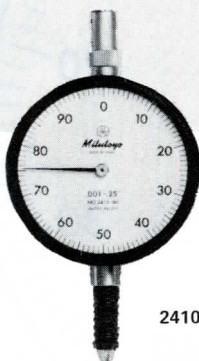


4803

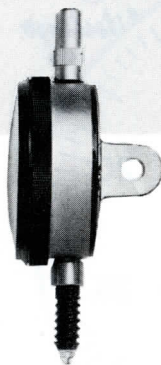
**New Series 4
Dial Indicators**



4411



2410-60

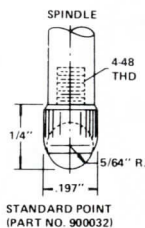


**New Series 2
Water-Proof Indicators**

DIAL INDICATORS

Standard Point

All Inch MITUTOYO Dial Indicators and ANSI specified Metric Indicators are furnished with the standard contact point **No. 900032** shown here. The 1/4" point length and #4-48 NF threads conform to all three specifications; AGD., MIL. and ANSI. The point is made of 5/32" DIA. hardened steel ball.



Available in .001", .0005", .0001" Graduations

DIAL INDICATORS

Series 1, 2, 3, 4

SPECIFICATIONS

MITUTOYO offers dial indicators in the four basic AGD Series, with inch and metric graduations. These instruments conform to the three specifications governing dial indicators, highlights of which follow. The scope of available ranges and graduations is such that MITUTOYO is, now, one of the largest producers of dial indicators.

In addition to the AGD Series of dial indicators, MITUTOYO offers "Hicators" which are ultra-sensitive, high-magnification indicators, reading in 50 millionths directly on the dial face. The "Signal Hicator", with Go/No-Go illuminator, is another unique MITUTOYO product. It is recommended for sorting high-precision production parts and checking close tolerances.

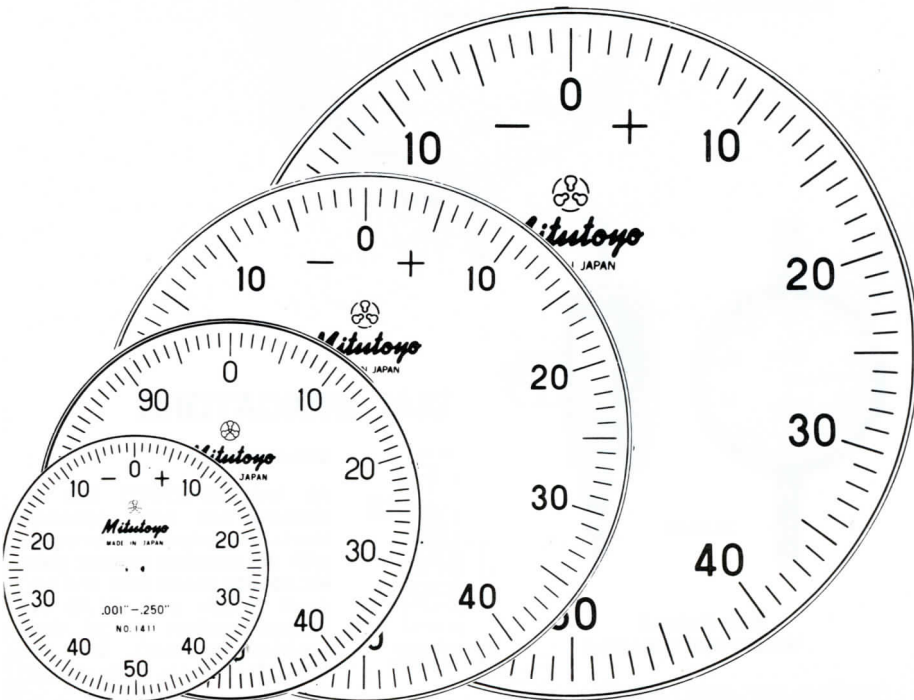
American Gage Design (AGD)

To standardize minimum essential requirements for precision dial indicators, AGD specifications were introduced in 1945 from the National Bureau of Standards, as a Commercial Standard.

They provide standards of performance and basic exterior dimensions (next page) in order to permit interchangeability.

Following are a digest of the specifications.

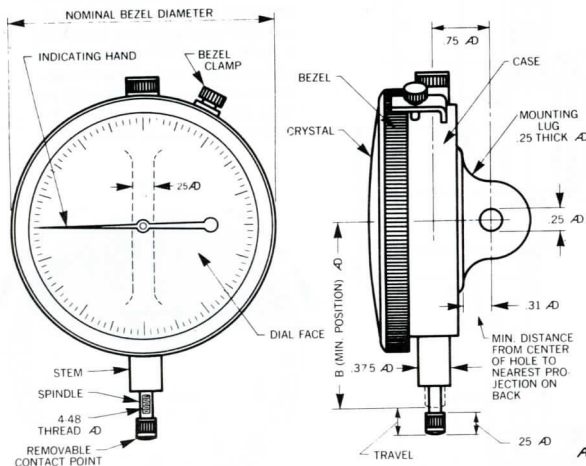
- a. Repeatability—within plus or minus one-fifth graduation at any point.
- b. Accuracy—shall be accurate to within one graduation, plus or minus, at any point (2-1/3 turns).
- c. Spindle range—the range of spindle travel should be a minimum of 2-1/2 revolutions of the indicating hand.



Series 1 Series 2 Series 3 Series 4 (Dial Faces shown actual size)



DIAL INDICATORS Series 1, 2, 3, 4



NOTE: TRAVEL OF SPINDLE
EQUALS A MINIMUM OF
2" TURNS OF HAND
IN ALL GROUPS AD

Mitutoyo Series	AGD Series	Mil Specs.	BEZEL DIA.		B Minimum Position
			Above	To And Including	
1	1	1	1-3/8"	2"	1-5/8"
2	2	2	2"	2-3/8"	2"
3	3	3	2-3/8"	3"	2-1/8"
4	4	4	3"	3-3/4"	2-9/16"

AD means American Gage Design Specification.

- Hand position—the indicating hand shall be set at the approx. 9 o'clock position when the spindle is fully extended.
- Smallest graduation—English: .00005", .0001", .0005", .001". Metric: 0.001mm, 0.002mm, 0.005mm and 0.01mm.
- Dial numbering—English: dial numbers shall always indicate thousandths of an inch regardless of magnification. Metric: dial numbers shall always indicate hundredths of a millimeter.

Military Specifications (MIL-1-18422E)

The MIL Specifications, approved by the Department of Defense, incorporate most AGD specifications, and set forth test procedures for the determination of repeatability, accuracy and durability.

Some of the highlights are:

- Repeatability—within plus or minus one-fifth graduation before and after 500,000 deflections.
- Accuracy—shall not be in error at any point within the range more than plus or minus one graduation before and after 500,000 deflections.
- Accuracy (calibration)—a minimum of 8 points, in equal increments over the range shall be calibrated (inward and outward

deflections without resetting the indicator dial).

- Repeatability (check points)—shall be checked for repetition of readings at points approx. 25, 50 and 75 percent of the full range.
- Durability—the indicator shall show no signs of significant wear or failure subsequent to 500,000 full scale deflections.
- Contact pressure—maximum force to deflect spindle was set forth on all types of dial and test indicators to indicate sensitivity requirements.

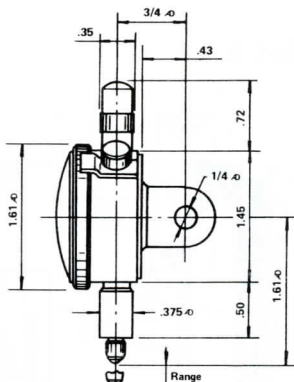
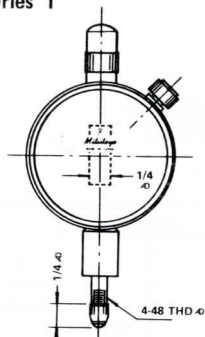
ANSI Specifications (ANSI B89.1.10)

Most recent specifications now proposed by the American National Standard Institute for mutual understanding between manufacturers and users. The basic contents confirm ADG and MIL specifications. However, it proposes the following:

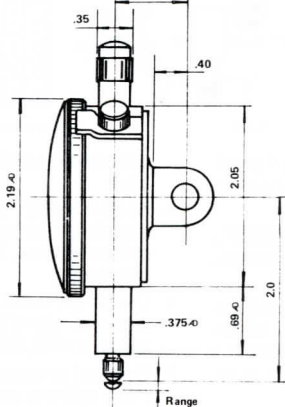
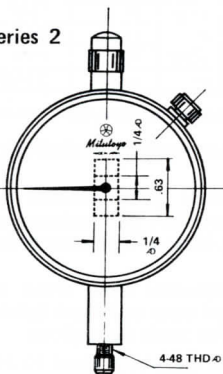
- Metric dial face shall be yellow.
- Graduations English: .00005", .0001", .0005" and .001". Metric: 0.001mm, 0.002mm, 0.01mm and 0.02mm (0.005mm graduation recognized by AGD was eliminated).

**MITUTOYO INDICATORS MEET
ALL SPECIFICATIONS**

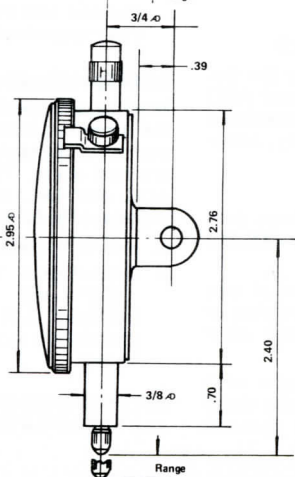
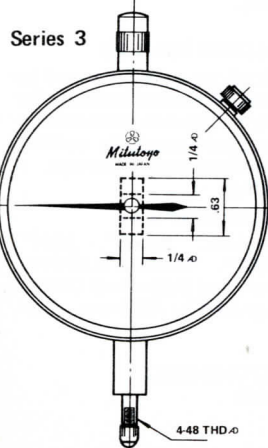
Series 1



Series 2

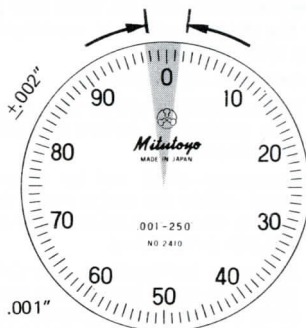
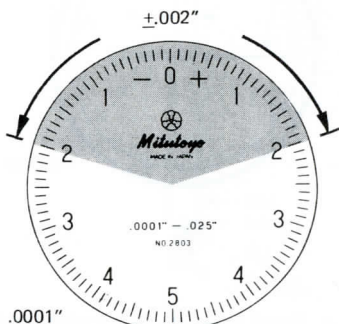


Series 3



DIAL FACES

As the following illustrations indicate MITUTOYO offers .0001", .0005", and .001" graduations on Series 1, 2, 3 and 4. The .0001" graduation indicators are preferred to check close-toleranced pieceparts. Many QC engineers adhere to the rule of 10 to 1 — (.0001" graduation to check .001").





DIAL INDICATORS SELECTION GUIDE

DIAL INDICATORS Series 1

Grad.	Range	No. (Continuous)		No. (Balanced)	
.0001"	.025"	---	---	1803	0-5-0
.0005"	.050"	1470	0-20	1471	0-10-0
	.075"	1570	0-30	1571	0-15-0
	.100"	1670	0-40	1671	0-20-0
	.125"	1506	0-50	1507	0-25-0
.001"	.100"	1156*	0-100	1157*	0-50-0
	.125"	1780	0-50	1781	0-25-0
	.250"	1410	0-100	1411	0-50-0
0.002mm	0.5mm	---	---	1011-11	0-10-0
0.02mm	2.6mm	1158*	0-260	1159*	0-130-0
0.01mm	2.5mm	1230	0-100	1231-01	0-50-0
	5mm	1044	0-100	1045-01	0-50-0

* - Back-plunger type Indicator

DIAL INDICATORS Series 2

.0001"	.020"	2938	0-8	2937	0-4-0
	.025"	2802	0-10	2803	0-5-0
		2802-70	0-10		
	.050"	2804	0-10	2805	0-5-0
				2923	0-5-0

NOTE: All .0001" graduation Series 2 Indicators have Jeweled Bearings and are Shockproof.

.0005"	.050"	2470-50	0-20	2471-50	0-10-0
	.075"	2570	0-30	2571	0-15-0
	.100"	2670	0-40	2671	0-20-0
	.125"	2506	0-50	2507	0-25-0
				2922	0-25-0
	1.000"	2776	0-50		
.001"	.125"	2780	0-50	2781	0-25-0
	.250"	2410	0-100	2411	0-50-0
		2410-10	0-100		
		2410-60	0-100		
		2919	0-100	2920	0-50-0
	.400"	2412	0-100	2413	0-50-0
	.500"	2414	0-100	2415	0-50-0
		2414-10	0-100		
		2915	0-100	2918	0-50-0
	1.000"	2416-10	0-100	2904	100-0
	2.000"	2424	0-100		

DIAL INDICATORS Series 2 (cont)

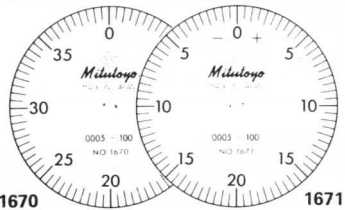
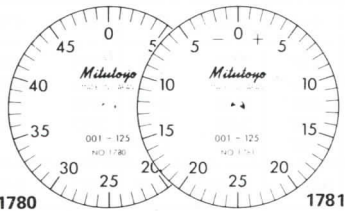
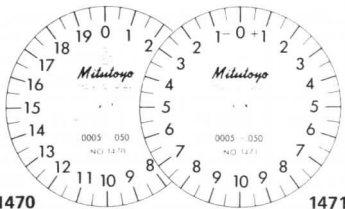
Grad.	Range	No. (Continuous)		No. (Balanced)	
0.001mm	1mm	---	---	2109-11	0-100-0
	5mm	---	---	2119-51	0-100-0
0.002mm	0.5mm	2010-11	0-20	2011-11	0-10-0
		2010-71	0-20	2011-71	0-10-0
0.005mm	1.25mm	2120-71	0-50	2121-71	0-25-0
0.01mm	2.5mm	2230	0-100	2231-01	0-50-0
	5mm	2044-61	0-100	2047-11	0-50-0
	10mm	2046-11	0-100		
		2048-11	0-100		
	20mm	2050	0-100		

DIAL INDICATORS Series 3

.0001"	.025"	3802	0-10	3803	0-5-0
.0005"	.075"	3570	0-30	3571	0-15-0
.001"	.125"	3780	0-50	3781	0-25-0
	.250"	3410	0-100	3411	0-50-0
	.400"	3412	0-100	3413	0-50-0
	1.000"	3416	0-100	3417	0-50-0
	2.000"	3424	0-100		
0.002mm	0.5mm	3010-11	0-20	3011-11	0-10-0
0.01mm	2.5mm	3230	0-100	3231-01	0-50-0
	30mm	3052	0-100		
		3052-11	0-100		
	50mm	3058	0-100		
		3058-11	0-100		

DIAL INDICATORS Series 4

.0001"	.025"	4802	0-10	4803	0-5-0
.0005"	.075"	4570	0-30	4571	0-15-0
.001"	.250"	4410	0-100	4411	0-50-0
	3.000"	4887	0-100		
0.01mm	2.5mm	4230	0-100	4231	0-50-0



STANDARD SPECIFICATIONS

- Vertically Mounted Lug on Center Back.
- Ball Type Standard Contact Point (900032)
Ball Radius 5/64".

DIAL INDICATORS Series 1

No.	Graduation	Total Range	Range per/Rev.	Dial Face	Note
1803	.0001"	.025"	.010"	0 5 0	Jeweled
1470	.0005"	.050"	.020"	0 20	
1471	.0005"	.050"	.020"	0 10 0	
1570	.0005"	.075"	.030"	0 30	
1571	.0005"	.075"	.030"	0 15 0	Jeweled
1670	.0005"	.100"	.040"	0 40	Jeweled
1671	.0005"	.100"	.040"	0 20 0	
1506	.0005"	.125"	.050"	0 50	
1507	.0005"	.125"	.050"	0 25 0	
1780	.001"	.125"	.050"	0 50	Jeweled
1781	.001"	.125"	.050"	0 25 0	
1410	.001"	.250"	.100"	0 100	
1411	.001"	.250"	.100"	0 50 0	
1011-11	0.002mm	0.5mm	0.2mm	0 10 0	Jeweled
1230	0.01mm	2.5mm	1mm	0 100	
1231	0.01mm	2.5mm	1mm	0 50 0	
1044	0.01mm	5mm	1mm	0 100	
1045	0.01mm	5mm	1mm	0 50 0	

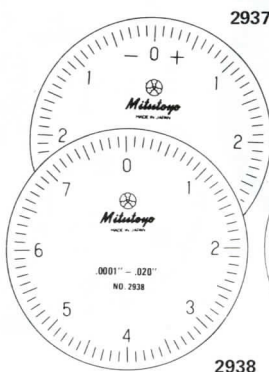


DIAL INDICATORS

GRADUATION .0001" 0.001mm
SHOCK PROOF, JEWELLED BEARING

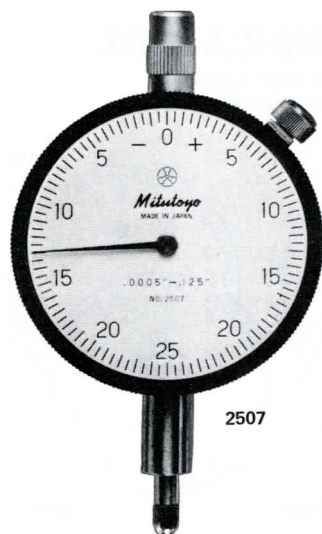


Balanced Dial Face
Minus On The Right
For Dial Bore Gages



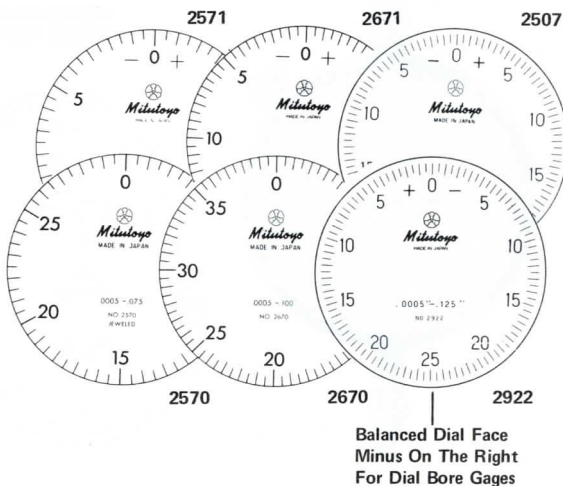
GRADUATION --- .0001" --- 0.001mm

	No.	Grad.	Total Range	Range per Rev.	Dial Face	Note
INCH	2938	.0001"	.020"	.008"	0 - 8	Jeweled Shockproof
	2937	.0001"	.020"	.008"	0 - 4 - 0	Jeweled Shockproof
	2802	.0001"	.025"	.010"	0 - 10	Jeweled Shockproof
	2802-70	.0001"	.025"	.010"	0 - 10	Jeweled Shockproof
	2803	.0001"	.025"	.010"	0 - 5 - 0	Jeweled Shockproof
	2804	.0001"	.050"	.010"	0 - 10	with Rev. Counter Jeweled Shockproof
	2805	.0001"	.050"	.010"	0 - 5 - 0	with Rev. Counter Jeweled Shockproof
	2923	.0001"	.050"	.010"	0 - 5 - 0	with Rev. Counter Jeweled Shockproof
METRIC	2109	0.001mm	1mm	0.2mm	0 - 100 - 0	with Rev. Counter Jeweled Shockproof
	2109-11	0.001mm	1mm	0.2mm	0 - 100 - 0	with Rev. Counter Jeweled Shockproof
	2119-51	0.001mm	5mm	0.2mm	0 - 100 - 0	with Rev. Counter Jeweled Shockproof



DIAL INDICATORS Series 2

GRADUATION .0005" 0.002mm, 0.005mm



PRIVATE BRAND, OEM AND SPECIAL DIAL INDICATORS.

Most dial indicators available in the market are made to conform to the AGD/MIL/ANSI specifications.

If indicators with other features are required, we quote and manufacture special dial indicators that meet your specifications.

	No.	Grad.	Total Range	Range per Rev.	Dial Face	Note
INCH	2470-50	.0005"	.050"	.020"	0 - 20	Jeweled
	2471-50	.0005"	.050"	.020"	0 - 10 - 0	Jeweled
	2570	.0005"	.075"	.030"	0 - 30	Waterproof
	2570-70	.0005"	.075"	.030"	0 - 30	
	2571	.0005"	.075"	.030"	0 - 15 - 0	
	2670	.0005"	.100"	.040"	0 - 40	
	2671	.0005"	.100"	.040"	0 - 20 - 0	
	2506	.0005"	.125"	.050"	0 - 50	Long Range with Revolution Counter
	2507	.0005"	.125"	.050"	0 - 25 - 0	
	2922	.0005"	.125"	.050"	0 - 25 - 0	
	2776	.0005"	1.000"	.050"	0 - 50	
METRIC	2010-11	0.002mm	0.5mm	0.2mm	0 - 20	Shockproof Jeweled
	2011-11	0.002mm	0.5mm	0.2mm	0 - 10 - 0	Shockproof Jeweled
	2010-71	0.002mm	0.5mm	0.2mm	0 - 20	Waterproof Jeweled
	2011-71	0.002mm	0.5mm	0.2mm	0 - 10 - 0	Waterproof Jeweled
	2120-71	0.005mm	1.25mm	0.5mm	0 - 50	Waterproof Jeweled
	2121-71	0.005mm	1.25mm	0.5mm	0 - 25 - 0	Waterproof Jeweled

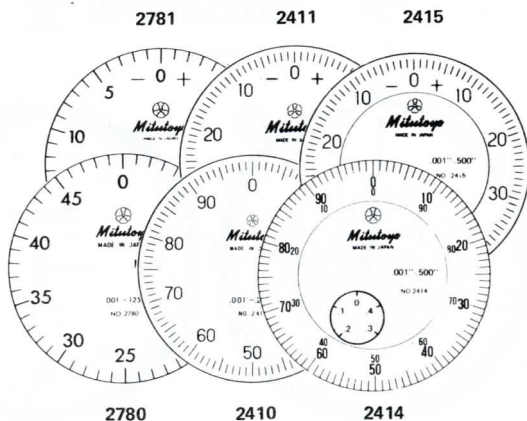


DIAL INDICATORS Series 2

GRADUATION .001" 0.01mm



2413



WATERPROOFED DIAL INDICATOR

The waterproofed dial indicators shown below consist of a heavy-duty dial housing, sealed crystal/bezel, sealed lug on center back and cap. And rubber plunger on the spindle. Completely soaked in the coolant or oilbath, the indicator runs smoothly just as a regular dial indicator.

	No.	Grad.	Total Range	Range per Rev.	Dial Face	Note
INCH	2780	.001"	.125"	.050"	0-50	Waterproof Jeweled
	2781	.001"	.125"	.050"	0-25-0	
	2410	.001"	.250"	.100"	0-100	
	2410-10	.001"	.250"	.100"	0-100	
	2410-60	.001"	.250"	.100"	0-100	
	2411	.001"	.250"	.100"	0-50-0	
	2412	.001"	.400"	.100"	0-100	
	2413	.001"	.400"	.100"	0-50-0	
	2414	.001"	.500"	.100"	0-100	
	2414-10	.001"	.500"	.100"	0-100	
	2415	.001"	.500"	.100"	0-50-0	
METRIC	2230	0.01mm	2.5mm	1mm	0-100	Waterproof Jeweled
	2231	0.01mm	2.5mm	1mm	0-50-0	
	2044-61	0.01mm	5mm	1mm	0-100	
	2046	0.01mm	10mm	1mm	0-100	
	2046-11	0.01mm	10mm	1mm	0-100	
	2047-11	0.01mm	10mm	1mm	0-50-0	
	2050-01	0.01mm	20mm	1mm	0-100	



ADJUSTABLE HAND DIAL INDICATORS

Series 2, 3

A TWIST OF THE
KNOB BRINGS
THE DIAL HAND
TO ZERO, OR
ANY OTHER DESIRED
POSITION, WITHOUT
LOSING THE
ORIGINAL CONTACT.

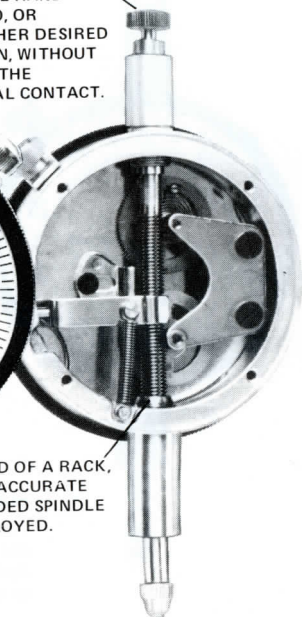


2915

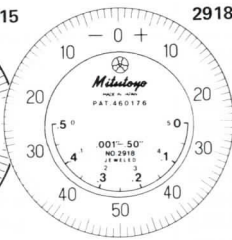


2920

INSTEAD OF A RACK,
MICRO-ACCURATE
THREADED SPINDLE
IS EMPLOYED.



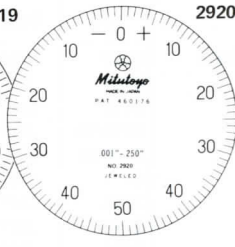
2915



2918



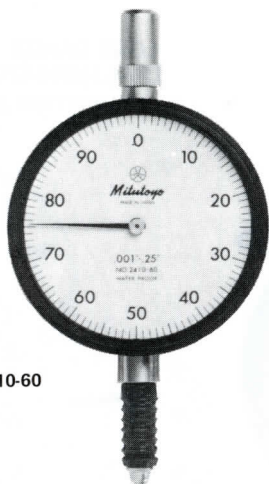
2919



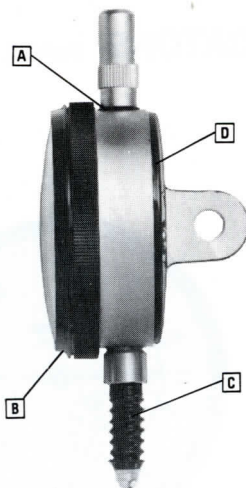
2920



	No.	Graduation	Total Range	Range per/Rev.	Dial Face	Note
Inch	2915	.001"	.500"	.100"	0-100	w/Rev. Counter Jeweled
	2918	.001"	.500"	.100"	0-50-0	w/Rev. Counter Jeweled
	2919	.001"	.250"	.100"	0-100	Jeweled
	2920	.001"	.250"	.100"	0-50-0	Jeweled
Metric	2048	0.01mm	10mm	1mm	0-100	w/Rev. Counter
	2048-11	0.01mm	10mm	1mm	0-100	w/Rev. Counter Jeweled



2410-60



WATERPROOF DIAL INDICATORS

Series 2

MITUTOYO's new Waterproof Dial Indicators perform effectively in the most adverse conditions. The indicator housing is ruggedly built, and the gear train assembly is completely protected against dust, coolant, oil mist and other undesirable particles in the shop.

Waterproof Dial Indicators are ideal for grinding and machining areas. They are not only water-resistant, but can be submerged in coolants.

FEATURES

- A** Sealed cap. No chance of coolant mist creeping in from here.
- B** Carefully designed "O"-ring is concealed beneath the dial face, yet allows smooth bezel adjustment.
- C** Water-proof boot. 3/8" DIA. stem and contact point are sealed by a soft rubber boot which also protects the spindle.
- D** Sealed back. Large, heavy-duty rubber seal is inserted between the lug-on-center back and housing. Nothing will go through from this side.

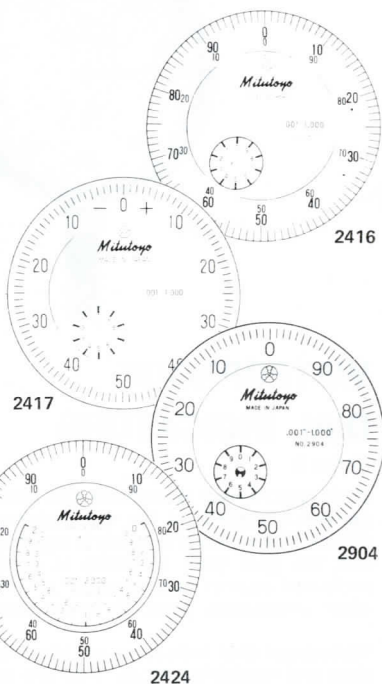
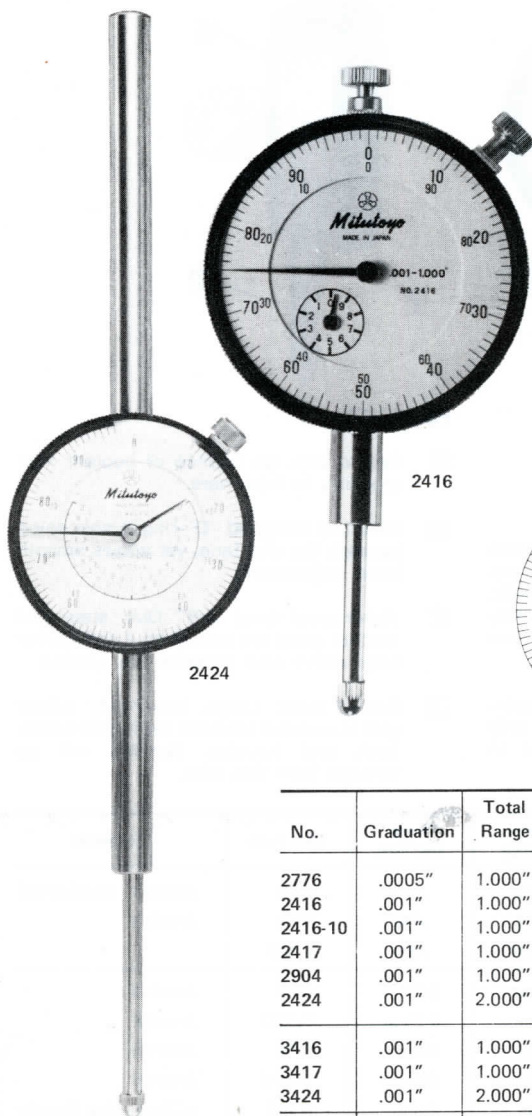
	No.	Graduation	Total Range	Range per/Rev.	Dial Face	Remarks
Inch	2802-70	.0001"	.025"	.010"	0-10	Jeweled Shockproof
	2570-70	.0005"	.075"	.030"	0-30	Jeweled
	2410-60	.001"	.250"	.100"	0-100	
Metric	2010-71	0.002mm	0.5mm	0.2mm	0-20	Jeweled
	2011-71	0.002mm	0.5mm	0.2mm	0-10-0	Jeweled
	2120-71	0.005mm	1.25mm	0.5mm	0-50	Jeweled
	2121-71	0.005mm	1.25mm	0.5mm	0-25-0	Jeweled
	2044-61	0.01mm	5mm	1mm	0-100	w/Revolution Counter



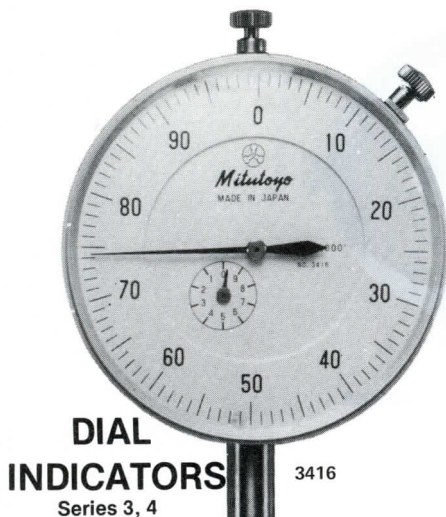
DIAL INDICATORS Series 2, 3, 4

LONG RANGE DIAL INDICATOR

GRADUATION .0005" .001"



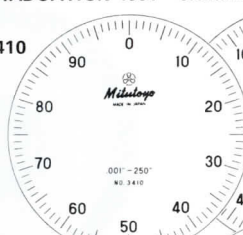
No.	Graduation	Total Range	Range per/Rev.	Dial Face	Note
2776	.0005"	1.000"	.050"	0-50	w/Rev. Counter
2416	.001"	1.000"	.100"	0-100	w/Rev. Counter
2416-10	.001"	1.000"	.100"	0-100	w/Rev. Counter Jeweled
2417	.001"	1.000"	.100"	0-50-0	w/Rev. Counter
2904	.001"	1.000"	.100"	100-0	w/Rev. Counter
2424	.001"	2.000"	.100"	0-100	w/Rev. Counter
3416	.001"	1.000"	.100"	0-100	w/Rev. Counter
3417	.001"	1.000"	.100"	0-50-0	w/Rev. Counter
3424	.001"	2.000"	.100"	0-100	w/Rev. Counter
4887	.001"	3.000"	.100"	0-100	w/Rev. Counter



3416

GRADUATION .001" 0.01mm

3410



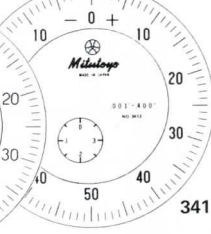
3411



3412



3413



DIAL INDICATORS

Series 3, 4

	No.	Graduation	Total Range	Range per/Rev.	Dial Face	Note
Inch Series 3	3802	.0001"	.025"	.010"	0-10	
	3803	.0001"	.025"	.010"	0-5-0	
	3570	.0005"	.075"	.030"	0-30	
	3571	.0005"	.075"	.030"	0-15-0	
	3780	.001"	.125"	.050"	0-50	
	3781	.001"	.125"	.050"	0-25-0	
	3410	.001"	.250"	.100"	0-100	
	3411	.001"	.250"	.100"	0-50-0	
	3412	.001"	.400"	.100"	0-100	w/Rev. Counter
	3413	.001"	.400"	.100"	0-50-0	w/Rev. Counter
	3416	.001"	1.000"	.100"	0-100	w/Rev. Counter Long Range
	3417	.001"	1.000"	.100"	0-50-0	w/Rev. Counter Long Range
	3424	.001"	2.000"	.100"	0-100	w/Rev. Counter Long Range
Metric Series 3	3010-11	0.002mm	0.5mm	0.2mm	0-20	Jeweled
	3011-11	0.002mm	0.5mm	0.2mm	0-10-0	Jeweled
	3230	0.01mm	2.5mm	1mm	0-100	
	3231	0.01mm	2.5mm	1mm	0-50-0	
	3052	0.01mm	30mm	1mm	0-100	w/Rev. Counter Long Range
	3058	0.01mm	50mm	1mm	0-100	w/Rev. Counter Long Range
Inch Series 4	4802	.0001"	.025"	.010"	0-10	
	4803	.0001"	.025"	.010"	0-5-0	
	4570	.0005"	.075"	.030"	0-30	
	4571	.0005"	.075"	.030"	0-15-0	
	4410	.001"	.250"	.100"	0-100	
	4411	.001"	.250"	.100"	0-50-0	
	4887	.001"	3.000"	.100"	0-100	w/Rev. Counter Long Range
Metric Series 4	4230	0.01mm	2.5mm	1mm	0-100	
	4231	0.01mm	2.5mm	1mm	0-50-0	

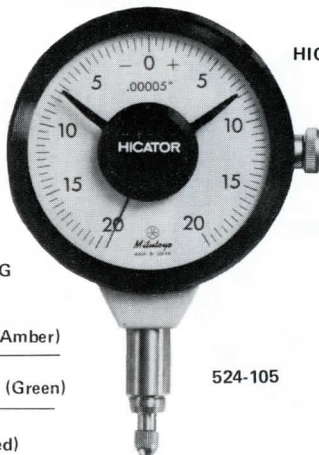
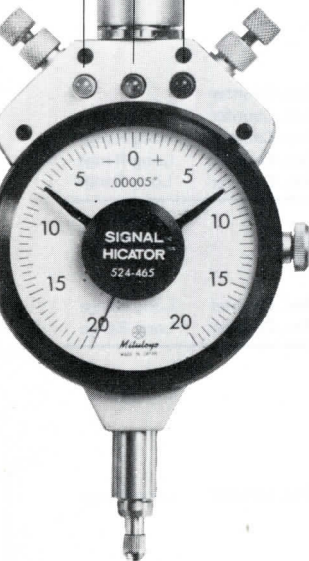
SIGNAL
HICATORINDICATING
LIGHTS

Under Size (Amber)

In Tolerance (Green)

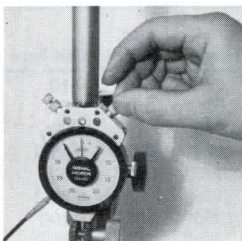
Oversize (Red)

524-465

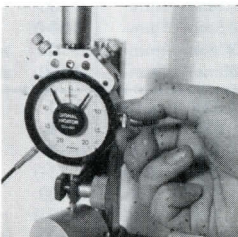


HICATOR

524-105



In addition to the adjustable mechanical limit hands on the dial face, the light indicator can be set throughout the range. A clock-wise rotation of the knurled screw narrows the tolerance band. The light indicator is set from plus and minus sides individually.



Black framed bezel is stationary. This knob is for fine-adjusting the dial face.

SIGNAL HICATOR

Series 524

The unique new comparator, Signal Hicator, is highly recommended for batch inspection, grading/sorting operation and close tolerance general purpose inspections.

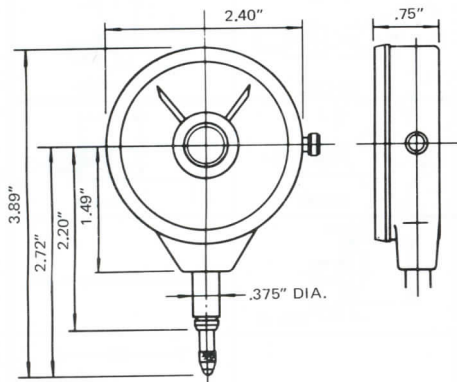
Two 1.5V batteries are stacked in the tube housing and generate high intensity miniature lamps; from left, amber (undersize), green (in tolerance) and red (oversize).

Under and oversize limit switches are set individually by the knurled knobs.

Besides the self-contained batteries and limit indicating signal lamps, the Signal Hicator features highly sensitive dial movements. Man-made rubies are lavishly used for extra high sensitivity. Pins and arms which make contact with other dial members are made of carbide for lasting accuracy. The Signal Hicator is definitely not an ordinary dial type comparator.



HICATOR DIMENSIONS

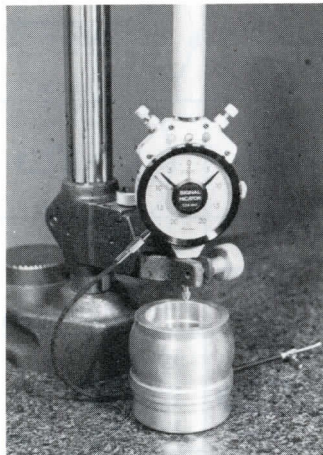
**HICATOR** Series 524

Both Hicators and Signal Hicators, shown here, provide 50 millionths (.00005") or 1 micron (0.001mm) graduations on the dial. Since most dial indicators read only .0001", the 50 millionths-reading Hicator Series is a welcomed supplement to the comparison measurements.

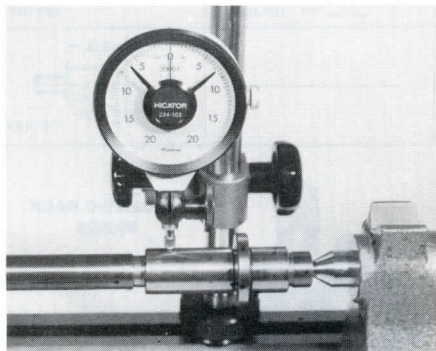
Both Hicators and Signal Hicators are featured with flat backs. Lug-on-center backs are not available for Hicators.

- Plus and minus side of the tolerance can be set individually.
- Fully jeweled, shock proof units.
- Indicating accuracy ± 40 millionths. Stability of indication 12 millionths. Repeatability of contact 20 millionths.
- Contact pressure less than 150gf.
- Supplied with a spindle retraction cable and fitted carrying case.

APPLICATION EXAMPLES

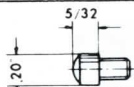
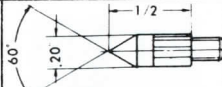
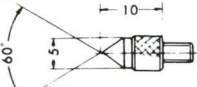
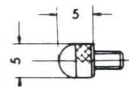
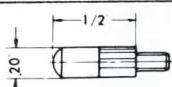
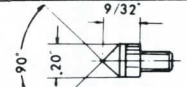
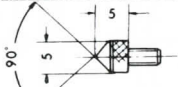
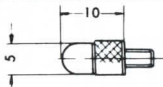
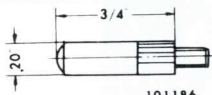
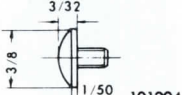
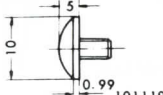
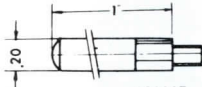

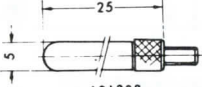
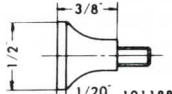
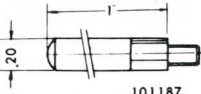
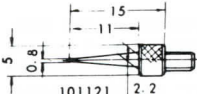
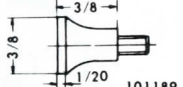
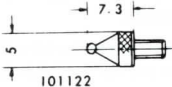
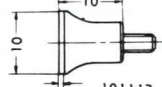
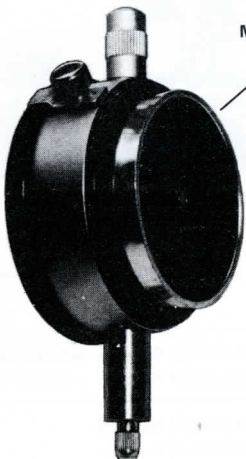
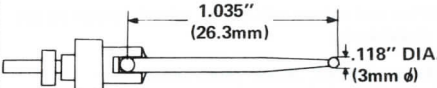


Measuring workpiece with the Signal Hicator. The illuminator above the dial face indicates under size, oversize or within the preset tolerance.



Checking run-out to 50 millionth. Bench Center 915-102 and Hicator 524-105 are utilized above.

		Range	No.	Grad.	Dial Face	Remarks
Signal Hicator	Inch	$\pm .002''$	524-465	.00005"	20-0-20	Full Jeweled Bearings w/Batteries
	Metric	$\pm 0.05\text{mm}$	524-461	0.001mm	50-0-50	Full Jeweled Bearings w/Batteries
Hicator	Inch	$\pm .002''$	524-105	.00005"	20-0-20	Full Jeweled Bearings
	Metric	$\pm 0.05\text{mm}$	524-101	0.001mm	50-0-50	Full Jeweled Bearings

ENGLISH POINTS		METRIC POINTS	
 101184	 101190	 101120	 101386
 101185	 101191	 101385	 101118
 101186	 101204	 101119	
 101187	 101205		 101388
 101188	 101187	 101121	
	 101189	 101122	 101117
 <p>MAGNETIC BACK 900928</p>		 <p>1.035" (26.3mm)</p> <p>±.118" DIA. ±(3mm φ)</p> <p>900393 (INCH) 900391 (METRIC)</p>	

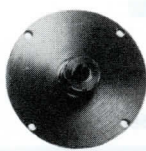
MAGNETIC BACK

Two magnetic backs are available for MITUTOYO Series 2 and 3 dial indicators. The back fits on inch or metric indicators. The magnet is designed to avoid direct contact with worksurfaces. The result is a longer lasting magnet, and stronger grip power.

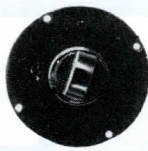
No.	Description	Series	Note
900928	Magnetic Back	(2)	For Metric & Inch Models
900929	Magnetic Back	(3)	For Metric & Inch Models

**ACCESSORIES** for Dial Indicators Series 1, 2 and 3

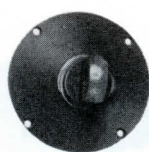
101168



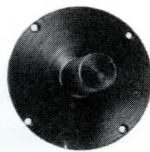
101170



101306



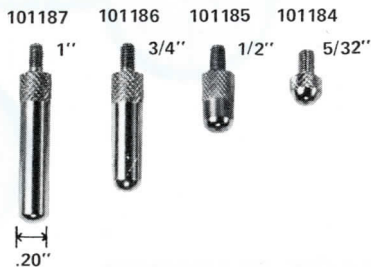
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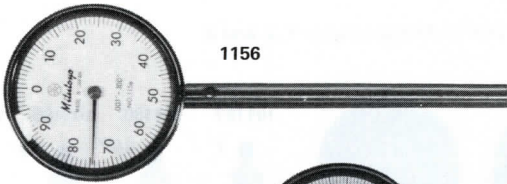
101169

ENGLISH

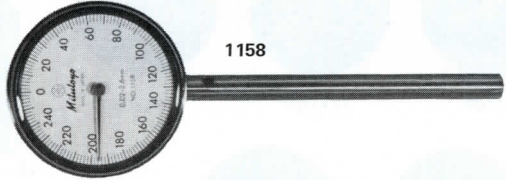
No.	Description	Series
100797	Back, Lug on center	(3)
100836	Back, Flat	(3)
100837	Back, Offset	(3)
100838	Back, Adjustable	(3)
100839	Back, Post	(3)
100840	Back, Screw	(3)
101039	Back, Flat	(2)
101047	Screw for lever	(1, 2 & 3)
101167	Back, Offset	(2)
101168	Back, Adjustable	(2)
101169	Back, Post	(2)
101170	Back, Screw	(2)
101184	Point, Length 5/32"	(1, 2 & 3)
101185	Point, Length 1/2"	(1, 2 & 3)
101186	Point, Length 3/4"	(1, 2 & 3)
101187	Point, Length 1"	(1, 2 & 3)
101188	Point, Flat dia. 1/2"	(1, 2 & 3)
101189	Point, Flat dia. 3/8"	(1, 2 & 3)
101190	Point, Sharp	(1, 2 & 3)
101191	Point, Conical	(1, 2 & 3)
101204	Point, Convex	(1, 2 & 3)
101205	Point, Convex	(1, 2 & 3)
101211	Back, Flat	(1)
101306	Back, Lug on center	(2)
101307	Back, Lug on center	(1)
900030	Point, Standard Metric Equivalent for 900032	(1, 2 & 3)
900032	Point, Standard	(1, 2 & 3)
900393	Point, Lever	(1, 2 & 3)

**METRIC**

No.	Description	Series
101117	Point, Flat 10mm dia. L: 10mm	(1, 2 & 3)
101118	Point, Spherical rmm dia. Length: 10mm	(1, 2 & 3)
101119	Point, Convex 10mm dia.	(1, 2 & 3)
101120	Point, 60 degrees	(1, 2 & 3)
101122	Point, Small Ball, 2mm dia.	(1, 2 & 3)
101385	Point, 90 degrees	(1, 2 & 3)
101386	Point, Spherical 5mm L. & dia.	(1, 2 & 3)
101387	Point, Spherical 5mm dia. Length: 25mm	(1, 2 & 3)
101388	Point, Spherical 5mm dia. Length: 25mm	(1, 2 & 3)
900391	Point, Adjustable Arm Arm Length: 26.3mm, Ball dia, 3mm	(1, 2 & 3)
100797	Back, Lug on center	(3)
100836	Back, Flat	(3)
100837	Back, Offset	(3)
100838	Back, Adjustable	(3)
100839	Back, Post Post dia. 1.27mm	(3)
100840	Back, Screw	(3)
101039	Back, Flat	(2)
101167	Back, Offset	(2)
101168	Back, Adjustable	(2)
101170	Back, Screw	(2)
101211	Back, Flat	(1)
101306	Back, Lug on center	(2)
101307	Back, Lug on center	(1)
900527	Lifting Lever up to .250"	(1)
900525	Lifting Lever up to .400"	(2 & 3)
900330	Lifting Lever up to 1"	(2 & 3)
101047	Screw for lifting lever	(1, 2 & 3)



1156



1158

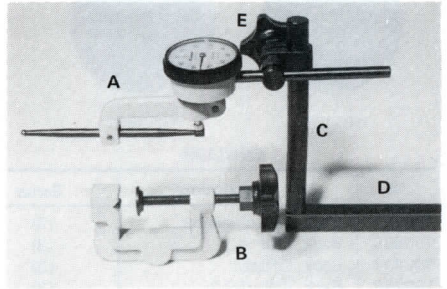
BACK PLUNGER DIAL INDICATORS

The MITUTOYO Back Plunger Dial Indicators are available with or without accessories. The 1/4" DIA. detachable stem is designed to fit into most of the existing fixtures which feature 1/4" DIA. universal clamps.

Metric Back Plunger Indicators have yellow dial faces, conforming to ANSI specifications.

Among the accessories, the Hole Attachment A, No. 900933, makes it easy to check internal locations of a workpiece while it is still on the lathe.

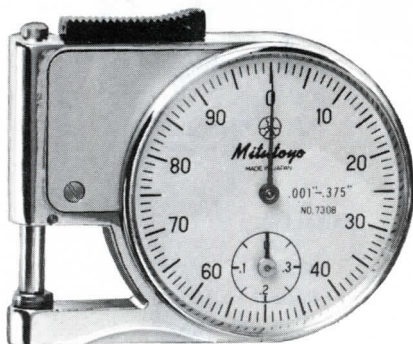
- Heavy-duty indicator and accessories.
- Indicator sets are supplied with fitted carrying case.



Accessories

- A. 900933** Hole attachment with .157" DIA. point.
- B. 900934** "C" Clamp. Capacity 1.33".
- C. 125341** Upright rod. Length 4.52", .472" DIA.
- D. 125342** Square holder. 4.72 x 4.72".
- E. 900935** Universal clamp.

		No.	Range	Graduation	Dial Face	Remarks
Individual Indicators	Inch	1156	.100"	.001"	0-100	
		1157	.100"	.001"	0-50-0	
	Metric	1158	2.6mm	0.02mm	0-260	
		1159	2.6mm	0.02mm	0-130-0	
Indicator Sets	Inch	950-156	.100"	.001"	0-100	with 1156 and 5 accessories
		950-157	.100"	.001"	0-50-0	with 1157 and 5 accessories
	Metric	950-158	2.6mm	0.02mm	0-260	with 1158 and 5 accessories
		950-159	2.6mm	0.02mm	0-130-0	with 1159 and 5 accessories



7308

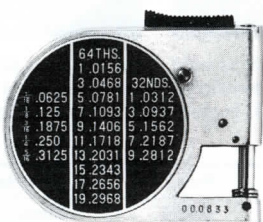


7309 (Metric)

POCKET THICKNESS GAGES Series 7

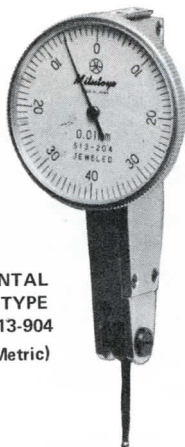
The smallest thickness gage made for carrying convenience, makes precise measurement to .001" (or .01mm) designed to quickly gage the thickness of paper, leather, wire, plastic sheet, sheet metal and the like.

The spindle is lifted atop the gage. It is preloaded so that a variety of materials can be measured with a consistent spindle pressure. Diameter of the spindle and anvil faces is .236". The pocket thickness gage is dull chrome finished, and weighs only 3 oz., spindle is chrome plated.

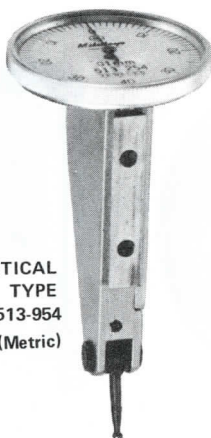


- Inch version No. 7308 comes with a decimal equivalent chart attached on the back of the case.
- Measuring faces are hardened, ground and lapped for accuracy.
- Easy adjustment for zero point — loosen tiny clamp screw on back of bottom frame, then adjust by turning the screw at bottom of anvil.
- Dimensions: 2 3/8" x 1 3/4" x 1/2" thick.

	Range	No.	Throat	Graduation
ENGLISH	.375"	7308	.39"	.001"
METRIC	9mm	7309	10mm	.01mm



**HORIZONTAL
TYPE**
513-904
(Metric)



**VERTICAL
TYPE**
513-954
(Metric)



**PARALLEL
TYPE**
513-984
(Metric)

“QUICK-SET” TEST INDICATORS Series 513

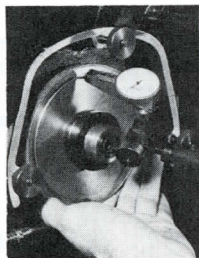
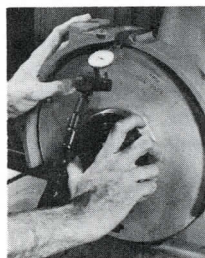
WITH JEWELLED BEARINGS

Metric and English test indicators are available in 4 types; horizontal, vertical, parallel and extra long point.

4mm and 8mm dia. stems are provided. Dove-tail slides on indicators and stems offer wide choice of mounting possibilities. Optional 3/8" dia. stem available for mounting in AGD stands.

The indicating hand is sensitive and quick to respond because of the jeweled bearings featured with all units. “Quick-Set” type test indicators are automatically reversible.

All Test Indicators are supplied with 1 carbide point for extra long life, plus 2 more chrome plated steel points for applications where a larger or smaller point diameter is required.

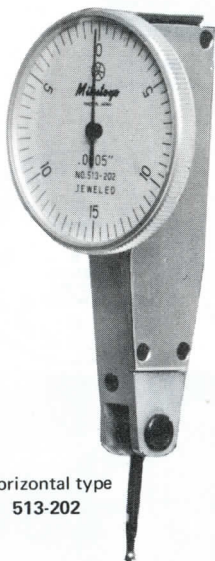


Test indicator is used here to set up grinding wheel. Concentricity is checked to a close tolerance as it is mounted on the machine.

Type	No.	Range	Graduation	Reading	Description
Horizontal	513-904	0.8mm	.01mm	0-40-0	Complete unit
Horizontal	513-905	0.2mm	.002mm	0-100-0	Complete unit
Long point++	513-924	0.5mm	.01mm	0-25-0	Complete unit
Horizontal	513-934*	0.4mm	.01mm	0-20-0	Complete unit
Vertical	513-254	0.8mm	.01mm	0-40-0	Basic unit
Vertical	513-255	0.2mm	.002mm	0-100-0	Basic unit
Vertical	513-954	0.8mm	.01mm	0-40-0	Complete unit
Vertical	513-955	0.2mm	.002mm	0-100-0	Complete unit
Parallel	513-984	0.8mm	.01mm	0-40-0	Complete unit

*Widely spaced graduations. For difference between the complete and basic unit, see next page.

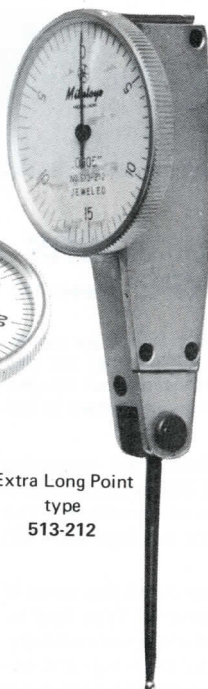
++Point 36.75mm



Horizontal type
513-202



Vertical type
513-253



Extra Long Point
type
513-212



Inch/Metric
Combistest
513-206

All test indicators are supplied with 1 carbide point for extra long life, plus 2 more chrome plated steel points for applications where a larger or smaller point diameter is required.

BASIC UNIT Set includes:

2 stems 102036, 102081 (102822 for metric indicators), 3 points 102824, 102826, 102825 carbide, and wrench 102037. Supplied in fitted carrying case.

COMPLETE UNIT Set consists of Basic Unit as listed above, plus clamp with dovetail 900322 (900321 for metric indicators) and holding bar 900306. Supplied with fitted plastic case.

Type	No.	Range	Graduation	Reading
Horizontal	513-202	.03"	.0005"	0-15-0
Horizontal	513-203	.008"	.0001"	0-40-0
Vertical	513-252	.03"	.0005"	0-15-0
Vertical	513-253	.008"	.0001"	0-40-0
Long P point	513-212	.03"	.0005"	0-15-0
Parallel	513-282	.03"	.0005"	0-15-0
Combistest	513-206	.03" 0.7mm	.0005" 0.01mm	0-15-0 35-0-35
Horizontal	513-902	.03"	.0005"	0-15-0
Horizontal	513-903	.008"	.0001"	0-40-0
Vertical	513-952	.03"	.0005"	0-15-0
Vertical	513-953	.008"	.0001"	0-40-0
Long Point	513-922	.03"	.0005"	0-15-0
Parallel	513-982	.03"	.0005"	0-15-0
Combistest	513-906	.03" 0.07mm	.0005" 0.01mm	0-15-0 35-0-35

See page 116 for accessories and dimensions.

513-304



953071
(Furnished)

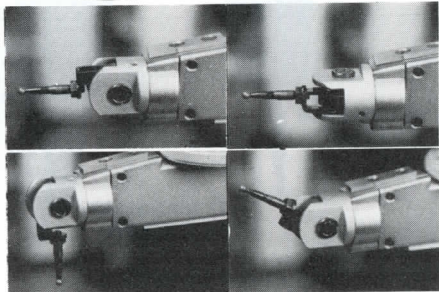
DIAL TEST INDICATORS UNIVERSAL TYPE Series 513

The Universal Type Dial Test Indicators are another innovative tool from MITUTOYO. They not only satisfy all the conventional functions, but also perform measurements which are not known to test indicators.

As the illustrations indicate, the measuring point can be rotated a full 360 degrees, by simply twisting the pivot area of the indicator. The contact point itself can be adjusted over 180 degrees.

There is no over and under clutch like some of the old indicators. The Universal Type Test Indicators measure over and under automatically. They are recommended for checking positions in tool rooms, on surface plates and with metal cutting machines.

- Universal application to all directions.
- Automatic contact point (no over/under clutch).
- Interchangeable contact point.
- Supplied with a new stem specially designed for Universal Type Test Indicators.
- Three dovetails for easier clamping.

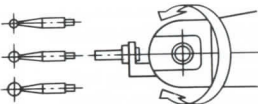


Not only the direction of the measuring point, but also the direction of measurement itself can be adjusted 360 degrees without moving the indicator.

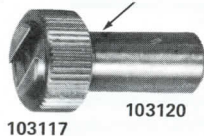
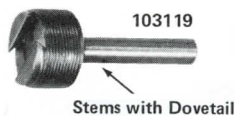
102824 (.039" DIA.)
Optional

102825 (.078" DIA.)
Mounted

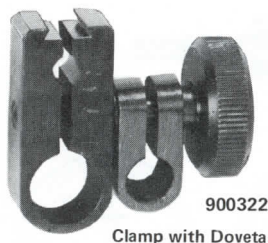
102826 (.118" DIA.)
Optional



		No.	Range	Graduation	Reading	Remarks
Basic Unit	Inch	513-302	.03"	.0005"	0-15-0	with Stem 953071 (3/8" dia.)
	Metric	513-304	0.8mm	0.01mm	0-40-0	with Stem 953070 (8mm dia.)
Complete Unit	Inch	513-942	.03"	.0005"	0-15-0	with Stem 953071 (3/8" dia.), Clamp 900291, Holding Bar 900306 (1/2 x 1/4") & Spare Point 102825 (.078" dia.)
	Metric	513-944	0.8mm	0.01mm	0-40-0	with Stem 953070 (8mm dia.), Clamp 900319, Holding Bar 900209 (9 x 9mm) & Spare Point 102825 (2mm dia.)



103120



900209



900306

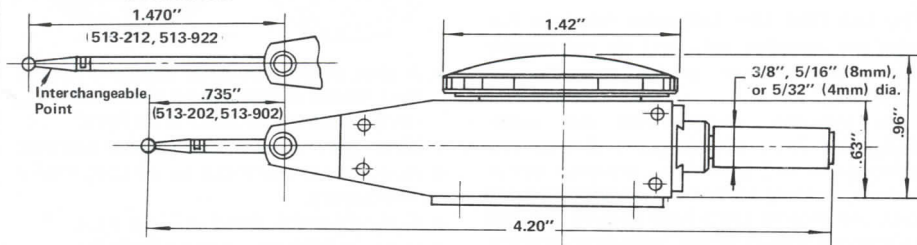


900210



900211

Dimensional Specifications



102824



102826

102037
Wrench

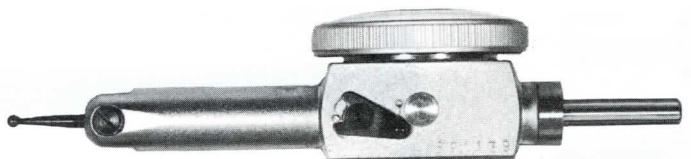
ACCESSORIES

The accessories shown on this page are for the Quick-Set Test Indicators described on page 114 and 115.

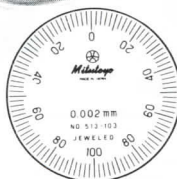
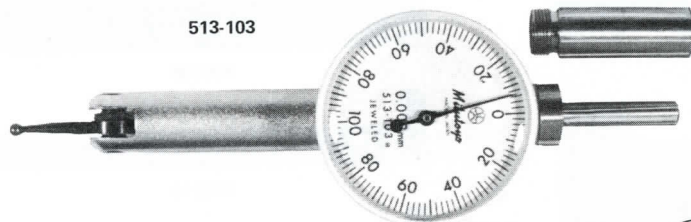
Both Metric and English Test Indicators can utilize same accessory, since dimensions of the dovetail and other parts are identical.

Measuring points are also interchangeable, and are made in these sizes: .04" (1mm), .08" (2mm) and .12" (3mm) dia.

Part No.	Description
102824	Point .04" (1mm)
102826	Point .12" (3mm)
102832	Point .08" (2mm)
102825	Point, Carbide .08"
102983	Point, Carbide .12"
102037	Wrench
103117	Knurled Clamping Ring
103119	Stem w/dovetail 5/32" dia.
103120	Stem w/dovetail 3/8" dia.
103118	Stem w/dovetail 5/16 (8mm) dia.
900209	Holding Bar .35" x .35"
900210	Holding Bar 5/16" x 3/16"
900211	Holding Bar 5/16" dia.
900306	Holding Bar 1/2" x 1/4"
900322	Clamp w/dovetail, 5/32" & 3/8" dia.
900321	Clamp w/dovetail, 5/32" & 5/16" dia.



513-103



DIAL TEST INDICATORS

Series 513 with Jewelled Movements

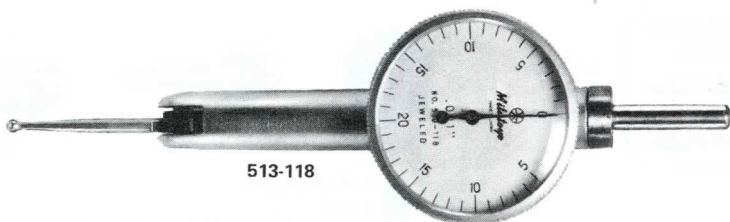
The two Dial Test Indicators listed on this page are complete sets, and do not require additional accessories for most measuring applications.

Each indicator comes with one interchangeable 2mm carbide point, 2 mounting stems 4mm and 8mm dia., universal clamp, wrench, holding bars and a compact carrying case. All moving parts have jeweled bearings to improve sensitivity and indicating accuracy.

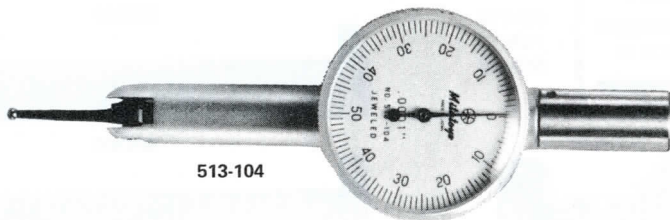
A reversing lever is attached to the body to measure top and bottom surfaces of the work-piece.

- A slim, pencil-type body (approx. 10mm dia.) makes it possible to reach narrow lands between shoulders or in bore.
- Major moving parts have jeweled bearings.
- Angle of the point can be adjusted nearly 240 degrees.
- Fully adjustable Bezel and Dial Face.
- Optional 3/8" dia. stem available for mounting in AGD stands.
- Complete with accessories and compact carrying case.

Range	No.	Graduation	Reading	Remarks
0.2mm	513-103	0.002mm	0-100-0	Set includes: Stems 102036 & 102822 Carbide Point 103010 Holding Bars 900211 & 900306 Clamp 900319 and Wrench 102037
0.8mm	513-117	0.01mm	0-40-0	Set includes: Stems 102036 & 102822 Carbide Point 103006 Holding Bars 900211 & 900306 Clamp 900319 and Wrench 102037



513-118



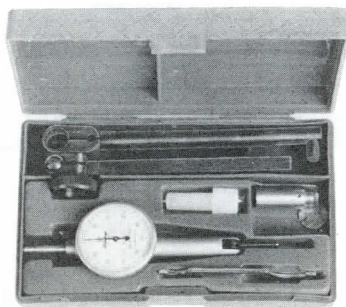
513-104

DIAL TEST INDICATORS

Series 513—with Jewelled Movements

Finely jeweled Mitutoyo Test Indicators, 513-104 and 513-118, are among the most frequently used testing gages in the shop. As detailed below, each set is furnished with a number of accessories for quick and easy adaptation to the holding fixtures. The indicator comes with one interchangeable .08" carbide point, 2 stems, a universal clamp and wrench, two holding bars and a fitted carrying case. A minute deflection sensed by the contact point is magnified by the crown gear and indicated in .001" (513-118) or .0001" (513-104) on the dial.

- Jewelled bearings assure higher sensitivity and accuracy.
- Reversible contact point.
- Two holding bars are supplied. One ($\frac{1}{2}'' \times \frac{1}{4}''$) is used with lathe tool posts and height gages, the other (.315" dia.) with drill chucks.
- Fully adjustable bezel/dial face.
- Contact point is adjustable within 240 degrees. Two extra points (.040" & .12" dia.) are supplied with set 513-118.
- Complete with accessories and compact carrying case.



Range	No.	Graduation	Reading
.01"	513-104	.0001"	0-50-0

Set includes stem (102081) and point (103011) already in stalled Plus bars (900306) and (900211) and clamp (900291) and Wrench (102037)

.04"	513-118	.001"	0-20-0
------	---------	-------	--------

Set includes Stems (102036, 102081) and Point (103007) already installed. Plus bar (900306) and (900211); Point (103008) and (103009); Clamp (900291); Stem (102081) and Wrench (102037)



POINTS
FOR
513-117



102037



102036



102081



POINTS
FOR
513-103



900209



900306



900210

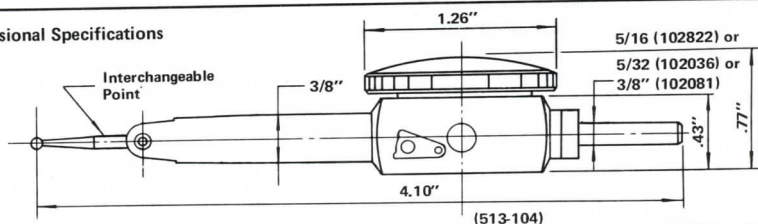


900211



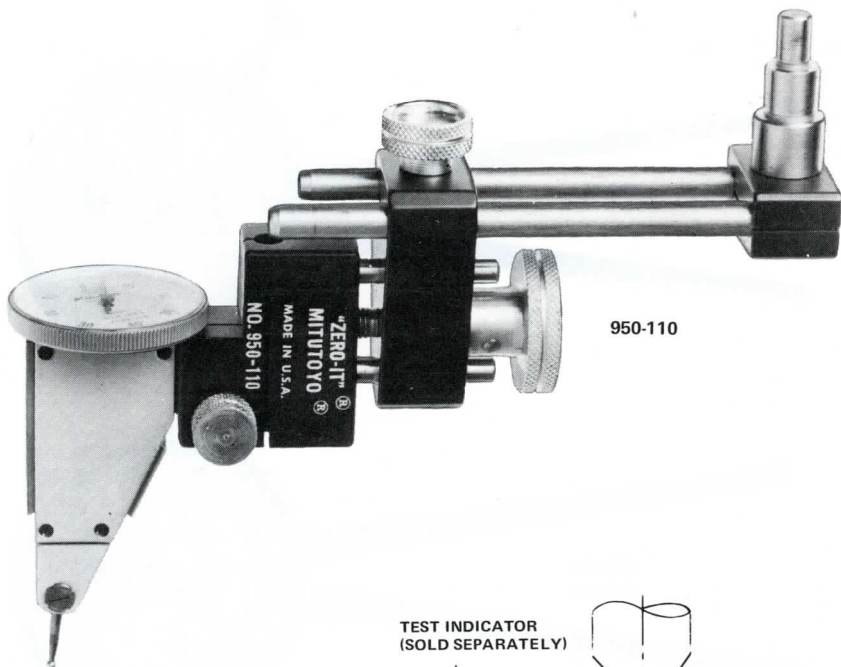
900291

Dimensional Specifications



ACCESSORIES FOR DIAL TEST INDICATORS

No.	Description	No.	Description
102036	Stem, 5/32" (4mm) dia. L:70"	Points for 513-103 L: 11.2mm)	
102081	Stem, 3/8" (9.5mm) dia. L:80"	103018	Steel Point 3mm dia.
102822	Stem, 5/16" (8mm) dia. L:80"	103010	Carbide Point 2mm dia.
102037	Wrench for changing Points	103017	Steel Point 1mm dia.
Points for 513-117 (L:17.36mm)		Point for 513-104 (L:440")	
103014	Steel Point 3mm dia.	103011	Carbide Point .079" dia.
103006	Carbide Point 2mm dia.	900209	Holding Bar .35" x 35"
103013	Steel Point 1mm dia.	900210	Holding Bar 5/16" x 3/16"
Points for 513-118 (L:682")		900306	Holding Bar 1/2" x 1/4"
103007	Steel Point .079" dia.	900211	Holding Bar .315" dia.
103008	Steel Point .039" dia.	900291	Universal Clamp 5/32 & 3/8" dia.
103009	Steel Point .118" dia.	900319	Universal Clamp 5/32 & 5/16 (8mm) d.



950-110

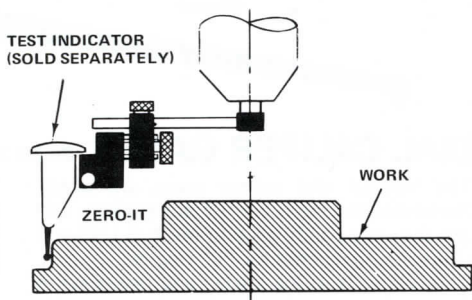
"ZERO-IT"

A real time saver when making setups

This attachment called "Zero-It" is specially prepared for MITUTOYO Test Indicators with Dovetails, and functions as a quick and practical means of work positioning device.

Setting up a work before machining, or aligning the center of a round work in relation to the cutting head takes no time with "Zero-It".

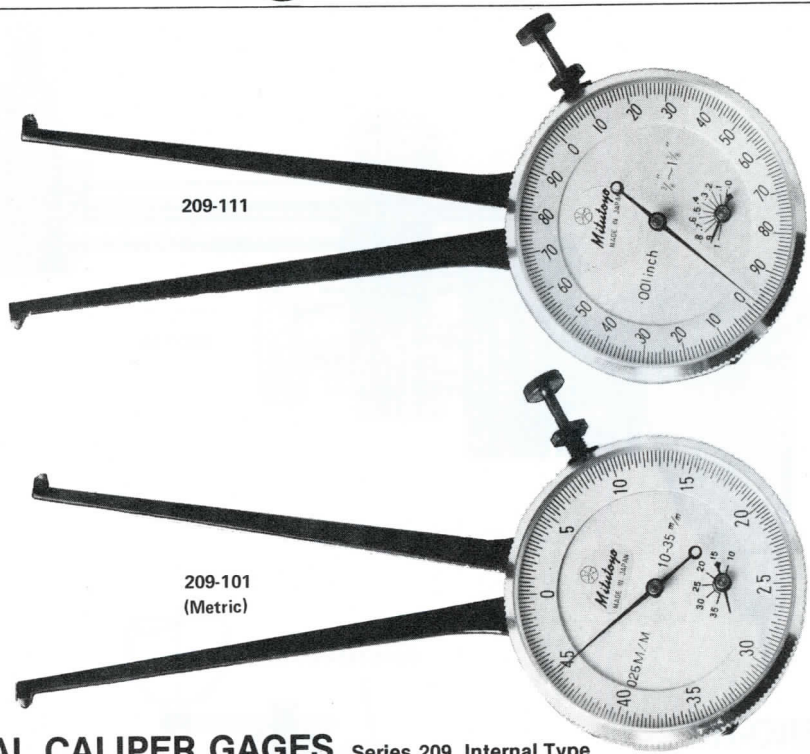
Attach "Zero-It" directly to the collet, now you can zero-in the work position by reading MITUTOYO Test Indicator. The hardened clamping post consists of three ODs, from top, 1/4", 3/8" and 1/2", and has hardness of approximately 58 to 60 Rockwell C.



Above illustration indicates alignment of a work in relation to the cutting head. It reaches anywhere within 10" diameter and fine-adjusts about 3/8" with a large knurled knob.

It can also be adapted to MITUTOYO's Transfer Stands such as No. 519-109 and No. 7003 for closer control of the Test Indicator in horizontal direction.

Coarse	Fine	No.	Description
10"	3/8"	950-110	"Zero-It" Attachment for MITUTOYO Test Indicators with Dovetail.

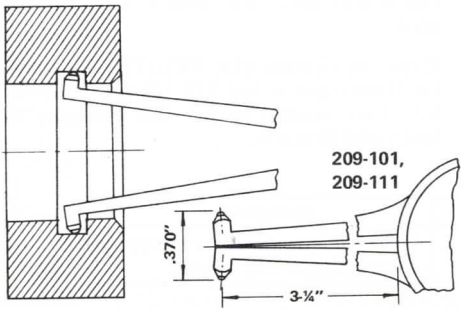


DIAL CALIPER GAGES Series 209, Internal Type

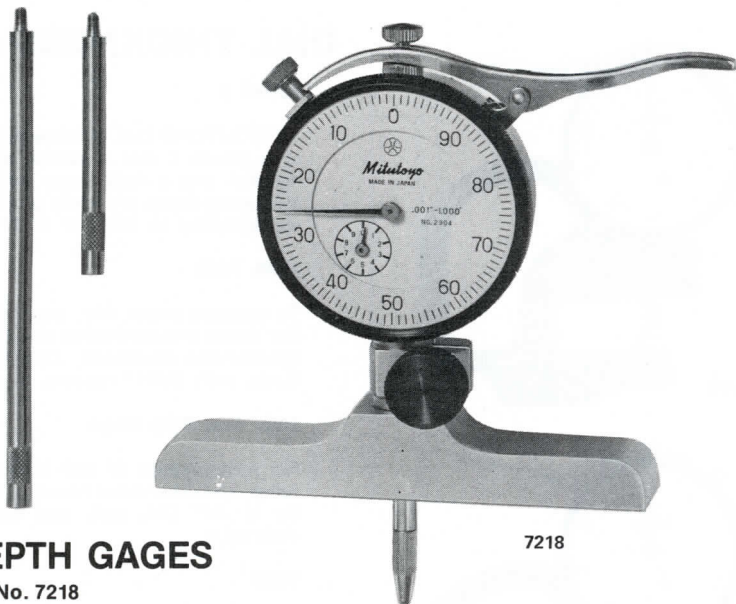
The internal dial caliper gages are highly recommended for quick ID comparison, and are the only handy gage to reach 3-1/4" and still measure recesses for "O" ring etc. The caliper is spring loaded and makes point contact at constant measuring pressure. The dial caliper gage, is used only as a comparison gage, and should be used along with a master ring or a micrometer.

The moveable bezel/graduation plate must be adjusted before gaging by bringing zero point to a known size.

- Black oxide finish caliper arms have 0.04" dia. steel ball on the measuring tips.
- Chrome plated housing and bezel.
- With revolution counter.
- Choice of inch or metric models.
- Measures hard-to-get-at IDs.
- Smallest graduation .001" or .025mm
- Supplied with fitted carrying case.



Range	No.	Graduation
3/8 - 1-3/8"	209-111	.001"
1-3/8 - 2-1/8"	209-113	.001"
1-7/8 - 2-7/8"	209-115	.001"
10 - 35mm	209-101	0.025mm
30 - 55mm	209-103	0.025mm
50 - 75mm	209-105	0.025mm



7218

DIAL DEPTH GAGES

No. 7217 and No. 7218

For rapid, direct reading measurement of hole depth.

- The Dial Indicator has a precision ground hard chrome plated stem with a standard AGD 3/8" diameter. Contact point is hardened, ground and chrome plated steel. Spindle rack, pinions and pivots are hardened stainless steel to insure long wear and continuing accuracy. Bezel is cleanly knurled and smoothly adjustable with a clamping screw for positive settings. Accuracy of the Dial Indicator exceed Federal specifications.
- The Dial Indicator is attached to the base by a clamping screw and readily interchangeable with any other standard AGD dial indicator.
- Spindle lifting lever for raising and lowering and spindle is maintained under spring pressure.
- Bottom surface of the base is hardened, ground and lapped for the highest degree of flatness.
- Rods are available in 1", 2" and 4" lengths which may be connected for depths up to 8". (1" on Dial Indicator + 1" rod + 2" rod + 4" rod = 8").
10, 20, 30 and 100mm rods for Metric model.
- Complete with fitted carrying case.

INCH

Parts No.	Description
301655	1" Rod
301657	2" Rod
301659	4" Rod
301653	Contact Point

METRIC

Parts No.	Description
301654	10mm Rod
301656	20mm Rod
301658	30mm Rod
301660	100mm Rod
301652	Contact Point

	Range	No.	Dial Range	Graduation	Base Length	Note
Inch	0-8"	7217	0-1"	.001"	2-1/2"	with 1, 2, 4" rods
	0-8"	7218	0-1"	.001"	4"	with 1, 2, 4" rods
Metric	0-200mm	7212	0-10mm	0.01mm	100mm	with 10, 20, (2) 30, 100mm rods

No. 2904 dial indicator is used for inch models.

No. 2902 for metric.



DIAL THICKNESS GAGES

Series 7

All MITUTOYO Dial Thickness Gages consist of a Series 2 dial indicator, with revolution counter, and a rigid frame with handle. Measuring faces are finely ground for precise measurement to .001" or .0001" (7326 only).

7300, 7326

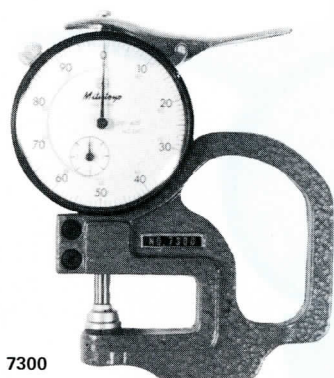
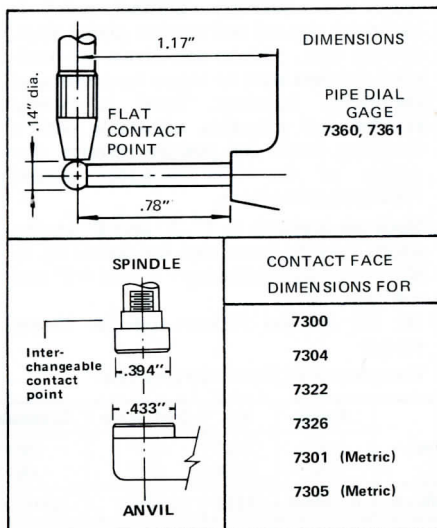
To measure paper, film, sheet, flat stock, etc. For closer measurements and to check a few thousandths deviations, 7326 Dial Thickness Gage, with .0001" reading, is recommended.

7361 Dial Pipe Gage

For measurement of wall thickness of pipes, tubes, and other items having a round ID. Anvil tip is .14" DIA. ball, and has .78" throat clearance.

7322

For sheet metals, wide sheets, etc. Throat depth 4-3/4", throat width 1-5/64". Anvil and spindle face dimensions are shown below.



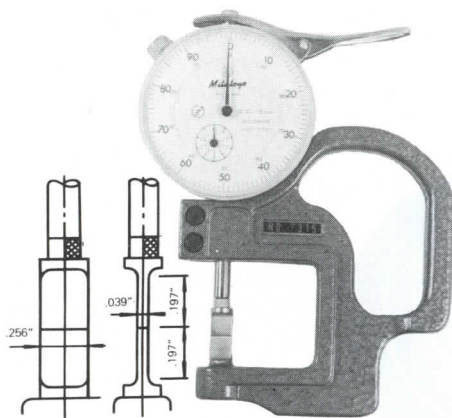
7300



7361



7322

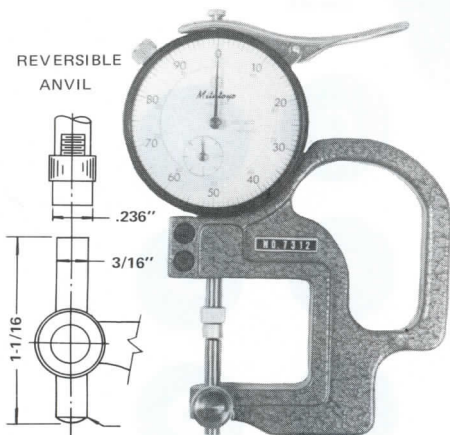


DIAL THICKNESS GAGES Series 7

7316 Blade Dial Thickness Gage

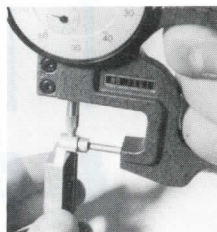
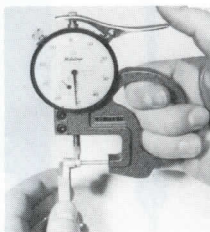
For recesses, O-ring grooves, slots, etc. Blade thickness .039". Throat depth 1-3/16", throat width 1-19/64". See illustration for more dimensional information.

REVERSIBLE ANVIL



7312 Adjustable Anvil Type

This dial thickness gage features a reversible anvil point with flat and spherical ends. The spherical end is used to measure such items as lenses.



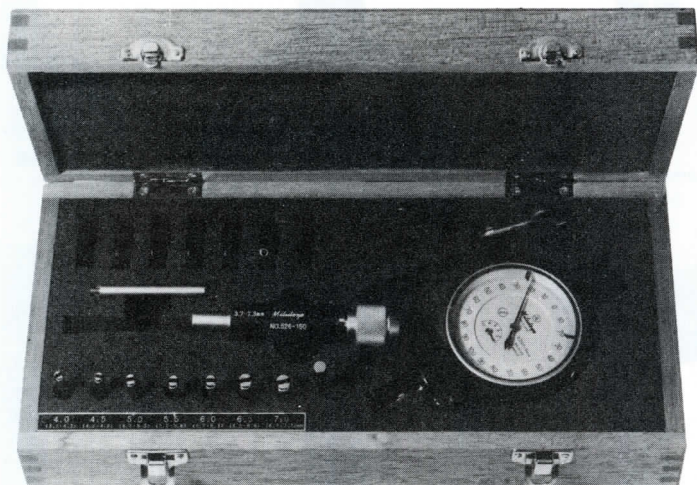
Small hole wall thickness being measured by a Dial Pipe Gage.

	Range	No.	Graduation	Throat Clearance	Dial Indicator	Remarks
Inch	0 - .400"	7300	.001"	1"	2412	Adjustable anvil type
	0 - .400"	7312	.001"	1-3/16"	2412	
	0 - .400"	7316	.001"	1-3/16"	2412	
	0 - .400"	7361	.001"	1-3/16"	2412	
	0 - 1"	7304	.001"	1-1/8"	2416	Deep throat type
	0 - 1"	7322	.001"	4-3/4"	2416	
	0 - .050"	7326	.0001"	1"	2804	
	0 - .050"	7326	.0001"	1"	2804	
Metric	0 - 10mm	7301	0.01mm	25mm	2046	Blade Dial Thickness Gage
	0 - 20mm	7305	0.01mm	25mm	2050	
	0 - 10mm	7315	0.01mm	30mm	2046	
	0 - 10mm	7360	0.01mm	20mm	2046	
	0 - 10mm	7360	0.01mm	20mm	2046	

BORE GAGES Series 526



526-160



526-152

BORE GAGES Series 526

The new dial bore gages shown here are for miniature hole measurements.

The smallest measurable bore is now .037" (0.95mm) DIA. with .0001" (0.001mm) reading dial indicator.

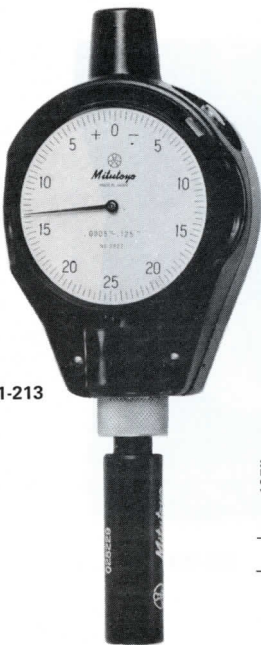
The gage is supplied with a set of split ball measuring contact points which are hard chrome-plated to retain original spheres.

Along with the measuring probes, setting rings are also provided to zero set the indicator whenever the probes are interchanged.

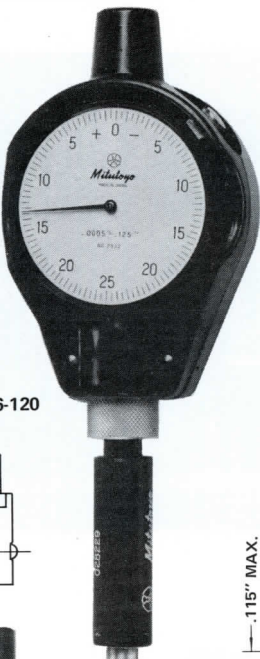
Actual ring size is engraved on the ring frames to the closest .0001" (0.001mm) value.

- Smallest measurable bore .037" (0.95mm)
- Supplied with a set of split ball contact probes and setting rings.
- Smallest reading .0001" or 0.001mm.
- Supplied with fitted carrying case with indexed probe storage and slots for ring gages.

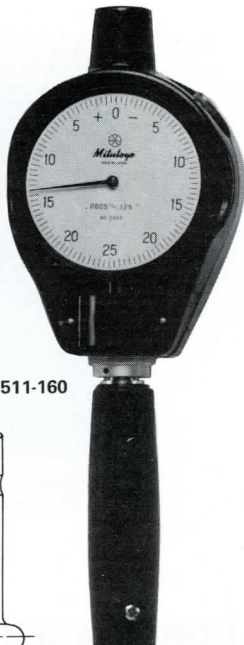
Range	No.	Graduation	Dial Indicator		Remarks
			No.	Face	
.037 - .061"	526-176	.0001"	2804	0-10	Shockproof Jeweled Bearing
.059 - .157"	526-166	.0001"	2804	0-10	Shockproof Jeweled Bearing
.145 - .287"	526-156	.0001"	2804	0-10	Shockproof Jeweled Bearing
0.95 - 1.55mm	526-172	0.001mm	2109	0-100-0	Shockproof Jeweled Bearing
1.5 - 4.0mm	526-162	0.001mm	2109	0-100-0	Shockproof Jeweled Bearing
3.7 - 7.3mm	526-152	0.001mm	2109	0-100-0	Shockproof Jeweled Bearing



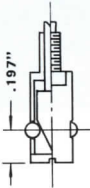
511-213



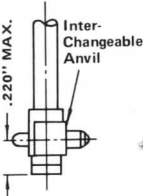
526-120

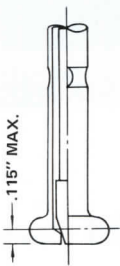


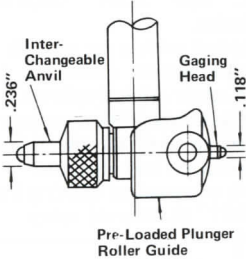
511-160



526-122
526-119

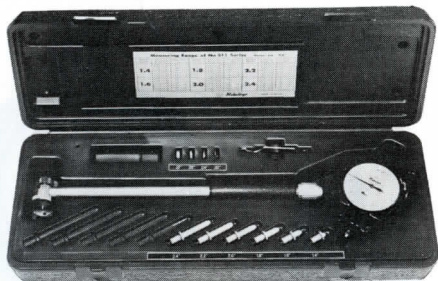






BORE GAGES Series 511, 526

MITUTOYO offers a complete selection of dial bore gages, all of them with interchangeable anvils and necessary accessories to perform close tolerance I.D. measurements. The smallest range measurable is .300", the largest one is 16". Some of the larger 511 series bore gages are equipped with a unique guiding device which facilitates accurate measurement of the bore because it is self-centering. The supplied AGD group 2 dial indicator is fully protected by a rugged cover. The smallest graduation on the dial face is either .0001" or .0005".



511-164

- All MITUTOYO Dial Bore Gages are supplied with AGD group 2 dial indicator and fitted carrying case.
- Dial protection cover is supplied as standard.
- A metal reference chart is also included, indicating which ring and rod sizes are to be selected for the specific range.
- 10" extension rod which is to increase measuring depth from the edge is available for 511-185, 186, 188, and 189.
- To increase the length of interchangeable measuring rods, a 2" extension collar is available.

ACCESSORIES:

- 101421** 2" Extension Collar for interchangeable rods (for use with 511-162 and 511-166).
950658 Dial protection cover for all MITUTOYO Dial Bore Gages.
950730 10" vertical extension rod for 511-185, 186, 188, 189.



950730

No.	Range	Probe Depth	Graduation	Actual Capacity	Number of Anvils	Number of Spacers
Series 511 and 526 Graduation .0001" with 2923 Dial Indicator						
511-212	.24 — .4"	2"	.0001"	.24 — .40"	9	—
526-122	.3 — .4"	1.25"	.0001"	.28 — .40"	6	—
526-123	.4 — .7"	2.4"	.0001"	.40 — .72"	8	—
511-163	.7 — 1.4"	4"	.0001"	.70 — 1.50"	8	3
511-164	1.4 — 2.5"	6"	.0001"	1.40 — 2.60"	6	4
511-166	2.0 — 6.0"	6"	.0001"	2.00 — 6.20"	11	4
511-187	4.0 — 6.5"	6"	.0001"	4.00 — 6.50"	13	4
511-188	6.5 — 10.0"	10"	.0001"	6.40 — 10.00"	6	6
511-189	10.0 — 16.0"	10"	.0001"	10.00 — 16.00"	5	6

Series 511 and 526 Graduation .0005" with 2922 Dial Indicator

511-213	.24 — .4"	2"	.0005"	.24 — .40"	9	—
526-119	.3 — .4"	1.25"	.0005"	.28 — .40"	6	—
526-120	.4 — .7"	2.4"	.0005"	.40 — .72"	8	—
511-159	.7 — 1.4"	4"	.0005"	.70 — 1.50"	8	3
511-160	1.4 — 2.5"	6"	.0005"	1.40 — 2.60"	6	4
511-162	2.0 — 6.0"	6"	.0005"	2.00 — 6.20"	11	4
511-184	4.0 — 6.5"	6"	.0005"	4.00 — 6.50"	13	4
511-185	6.5 — 10.0"	10"	.0005"	6.50 — 10.00"	6	6
511-186	10.0 — 16.0"	10"	.0005"	10.00 — 16.00"	5	6

Series 511 Set Graduation .0005" with 2922 Dial Indicator or .0001" with 2923 Dial Indicator

511-911	.7 — 6.0"	6"/10"	.0005" (2922)	.70 — 6.00"	26	8
511-912	.7 — 6.0"	6"/10"	.0001" (2923)	.70 — 6.00"	26	8

BORE GAGES

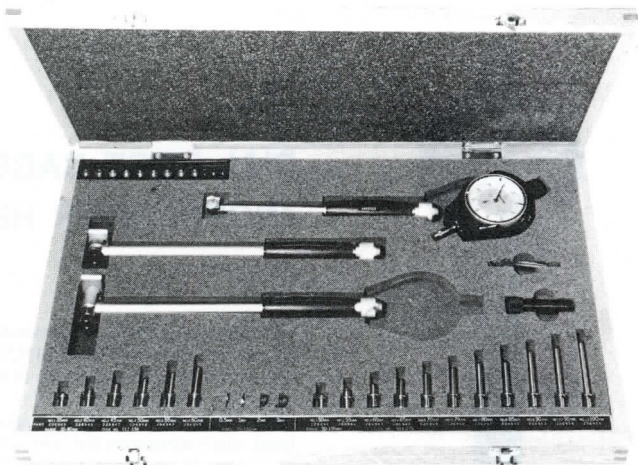
Series 511, 526

Metric dial bore gages shown above are slightly different from English models described on previous pages. The smallest reading on the dial face is .01mm with No. 2046 indicator, or .001mm with No. 2109. Both dial indicators are equipped with a pair of tolerance hands fitted on the bezel, and the hands are manually adjustable 360 degrees. Unlike English graduated indicators, the Metric ones provided with the bore gage have a flat crystal fitted integrally to the bezel. The smallest bore measureable is 10mm dia., the largest size is 160mm.



511-204
(Metric)

511-173
(Metric)



511-901 (Metric Set)

BORE GAGES Series 511

The application of a dial bore gage is often limited by its customary narrow measuring range. The bore gage set shown above solves the problem almost completely. With No. 511-901, the range is 18mm to 150mm, covering most I.D. bore gages.

- Smallest graduation 0.01mm or 0.001mm.
- 26 anvils to cover 18 - 150mm range.
- 50mm extension collar included.
- Uniquely designed guide for self-centering.
- Complete with indexed, fitted carrying case.

Series 511 Graduation .001mm with 2109 Dial Indicator

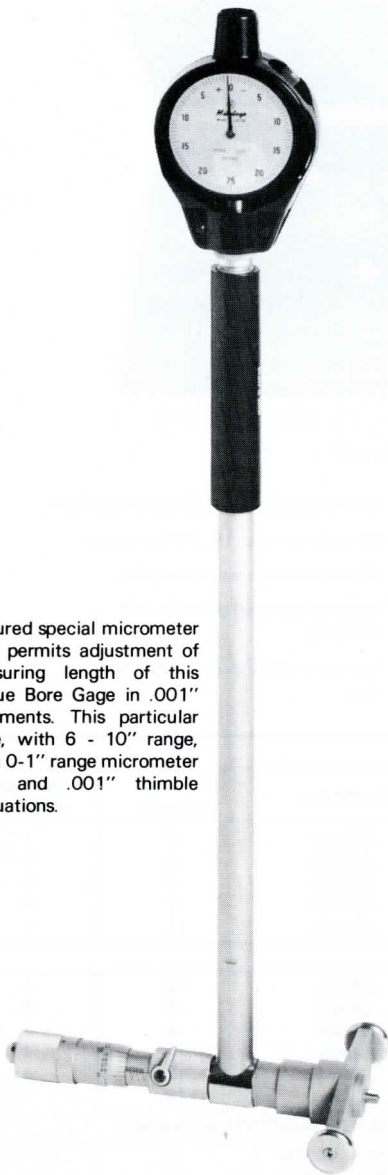
No.	Range	Probe Depth	Graduation	Number of Anvils	Number of Spacers
511-203	10-18.5mm	90mm	.001mm	9	1
511-167	18-35mm	100mm	.001mm	9	3
511-168	35-60mm	150mm	.001mm	6	4
511-169	50-100mm	150mm	.001mm	11	4
511-170	50-150mm	150mm	.001mm	11	4

Series 511 Graduation .01mm with 2046 Dial Indicator

511-204	10-18.5mm	90mm	.01mm	9	1
511-171	18-35mm	100mm	.01mm	9	3
511-172	35-60mm	150mm	.01mm	6	4
511-173	50-100mm	150mm	.01mm	11	4
511-174	50-150mm	150mm	.01mm	12	4
511-175	100-160mm	150mm	.01mm	13	4

Series 511 Set Graduation .01mm with 2046 Dial Indicator, .001mm with 2109 Dial Indicator

511-901	18-150mm	100/150mm	.01mm (2046)	26	6
511-902	18-150mm	100/150mm	.001mm (2109)	26	6



Featured special micrometer head permits adjustment of measuring length of this unique Bore Gage in .001" increments. This particular gage, with 6 - 10" range, has a 0-1" range micrometer head and .001" thimble graduations.

DIAL BORE GAGE WITH MICROMETER HEAD

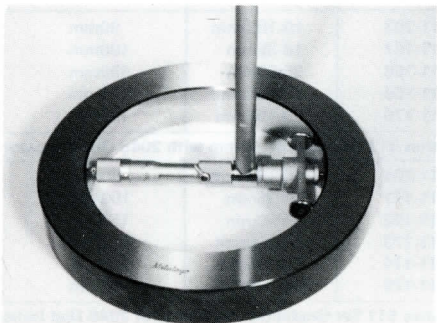
Series 511

Without using spacers or combinations of collars, it is possible with the new MITUTOYO Dial Bore Gages with Micrometer Heads to adjust measuring length in increments of .001".

These Bore Gages feature a special micrometer head which eliminates the time-consuming process of incorporating spacers or collars into the ID measuring instrument. Now, once the Bore Gage is zero set, and desired dimension established, the micrometer head will increase or decrease its length within the micrometer head range. The sensitive probe, on the opposite side, is protected by a pair of self-centering spring-loaded roller guides.

Extension Rod 952361 (Optional)

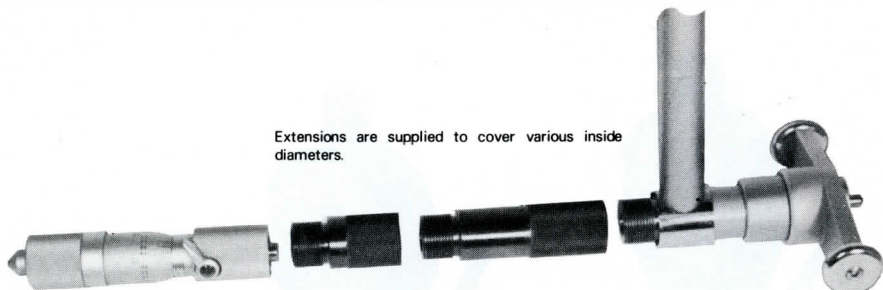
Optional 10" extension rod available. Bore Gages over 6" measuring range will measure ID's to 13" depth without extension, and to 23" with the extension.



Ring gages offer the best method of zero setting dial bore gages. See Series 177 or "Holtest" for more information.

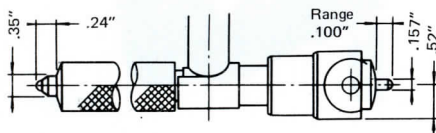


Extensions are supplied to cover various inside diameters.

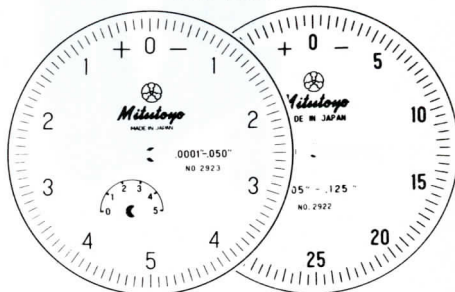


The smallest readings are either .0005" or .0001", furnished by Dial Indicators Nos. 2922 or 2923, respectively, which are supplied with the Bore Gage. Dial Indicator No. 2923 has a revolution counter to prevent reading errors by one revolution of the dial hand.

- Continuously adjustable range with .001" increments by micrometer head.
- Extensions furnished to cover greater length.
- No spacers or collars required to measure various inside diameters.
- Satin-chrome finished, non-glare micrometer head with positive locking clamp.
- Supplied with a dial indicator and fitted carrying case.



Dial Faces



2923 .0001"

2922 .0005"

	Range	No.	Grad.	No.	Grad.	Mike Head Travel	Extensions for Mike Head	Extension Rod (optional)
Inch	2.4 - 4"	511-335	.0005"	511-336	.0001"	.4"	.4", .8"	
	4 - 6.4"	511-325	.0005"	511-326	.0001"	.5"	.4", .8", .8"	
	6 - 10"	511-319	.0005"	511-320	.0001"	1"	1", 2"	10" (952361)
	10 - 16"	511-321	.0005"	511-322	.0001"	2"	2", 2"	10" (952361)
	16 - 24"	511-323	.0005"	511-324	.0001"	2"	2", 4"	10" (952361)
	24 - 32"	511-329	.0005"	511-330	.0001"	2"	2", 4"	10" (952361)
Metric	60 - 100mm	511-334	0.01mm	511-333	0.001mm	10mm	10, 20mm	
	100 - 160mm	511-312	0.01mm	511-311	0.001mm	13mm	10, 20, 20mm	
	150 - 250mm	511-314	0.01mm	511-313	0.001mm	25mm	25, 50mm	250mm (952361)
	250 - 400mm	511-315	0.01mm	511-315	0.001mm	50mm	50, 50mm	250mm (952361)
	400 - 600mm	511-318	0.01mm	511-317	0.001mm	50mm	50, 100mm	250mm (952361)
	600 - 800mm	511-328	0.01mm	511-327	0.001mm	50mm	50, 100mm	250mm (952361)



201-251

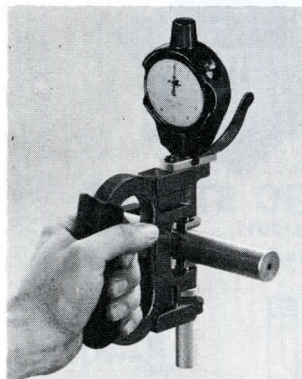
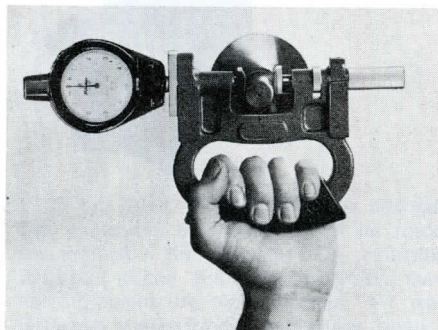
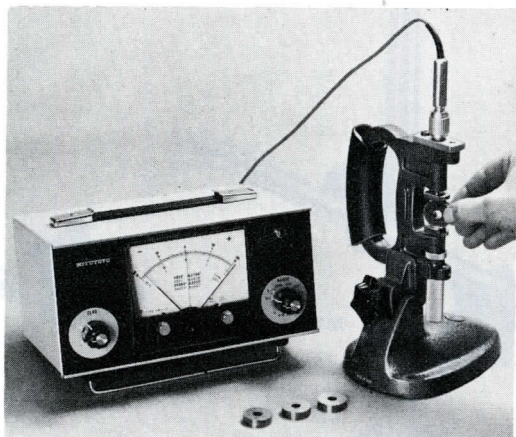
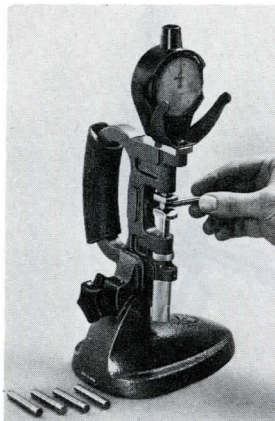


201-252

DIAL SNAP GAGES Series 201

With MITUTOYO Dial Snap Gages, Series 201 you can measure all types of external diameters quickly and accurately for the ranges up to 12". Any variation in diameter is registered instantaneously and reads directly from a shock-proof dial indicator graduated in .0001". Great numbers of the same sized workpieces can be measured within tolerance limits. The adjustable anvil provides a total 1" range of adjustment for each Dial Snap Gage.

- Wide flat carbide anvils.
- Both front edges of the anvils are chamfered for easy insertion.
- With or without shockproof .0001" Dial Indicator No. 2803.
- Accepts all A.G.D. Dial Indicators, group 2.
- Upper anvil travels 0.1"; lower anvil 1".
- Dial Indicator guard and two metal guards at the sides of Indicator protect Indicator from damage and provide a rest when gage is laid on its side.
- Insulated handle assures sure grip and minimizes effect of heat.
- Adjustable backstop.



Dial Snap Gages
Without Dial Indicator

Dial Snap Gages
With No. 2803 Shock-Proof Dial Indicator
.0001" Graduation and 0-5-0 Reading.

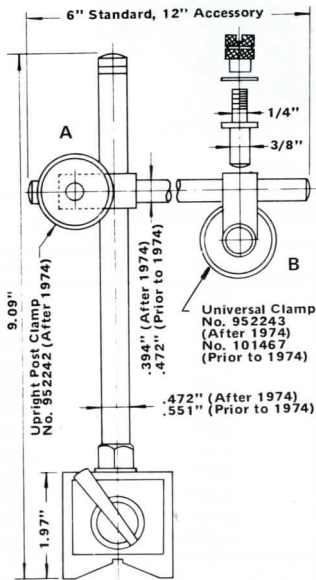
No.	Range	No.	Range	Graduation
201-151	0-1"	201-251	0-1"	.0001"
201-152	1-2"	201-252	1-2"	.0001"
201-153	2-3"	201-253	2-3"	.0001"
201-154	3-4"	201-254	3-4"	.0001"
201-155	4-5"	201-255	4-5"	.0001"
201-156	5-6"	201-256	5-6"	.0001"
201-157	6-7"	201-257	6-7"	.0001"
201-158	7-8"	201-258	7-8"	.0001"
201-159	8-9"	201-259	8-9"	.0001"
201-160	9-10"	201-260	9-10"	.0001"
201-161	10-11"	201-261	10-11"	.0001"
201-162	11-12"	201-262	11-12"	.0001"

Dial Indicator No. 2803 Range .025"



MAGNETIC STANDS

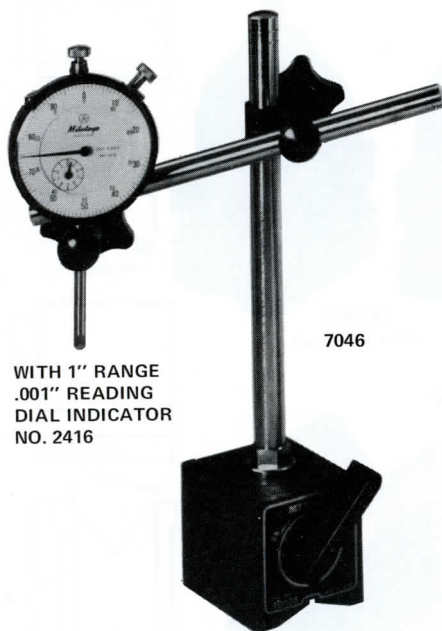
No. 7010 and No. 7011



Magnetic stand Nos. 7010, 7011 and 7012 accept all MITUTOYO dial indicators, test indicators, AGD specified dial indicators and other indicators having 3/8" and/or Lug Back with 1/4" diameter hole. All stands provide universal adjustment in horizontal and vertical planes. On-Off switch offers instant mounting and dismounting without giving adverse effect to the sensitive indicators.

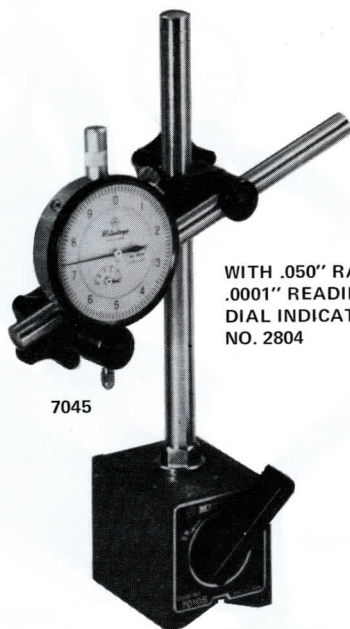
Parts No.	Description
206978	6" Dial holding rod .394" dia.
102112	6" Dial holding rod .472" dia.
952244	6" Adjustable rod .394" dia.
950731	6" Adjustable rod .472" dia.
206979	12" Dial holding rod .394" dia.
101405	12" Dial holding rod .472" dia.
952245	12" Adjustable rod .394" dia.
950732	12" Adjustable rod .472" dia.
952243	Universal clamp for .394" rod (B)
101467	Universal clamp for .472" rod (B)
952242	Clamp for upright post .472" Post (A)

No.	Description
7010	Magnetic Stand with 6" standard rod and universal clamp No. 952243
7011	Adjustable Magnetic Stand with 6" adjustable rod and universal clamp No. 952243



WITH 1" RANGE
.001" READING
DIAL INDICATOR
NO. 2416

7046



WITH .050" RANGE
.0001" READING
DIAL INDICATOR
NO. 2804

7045

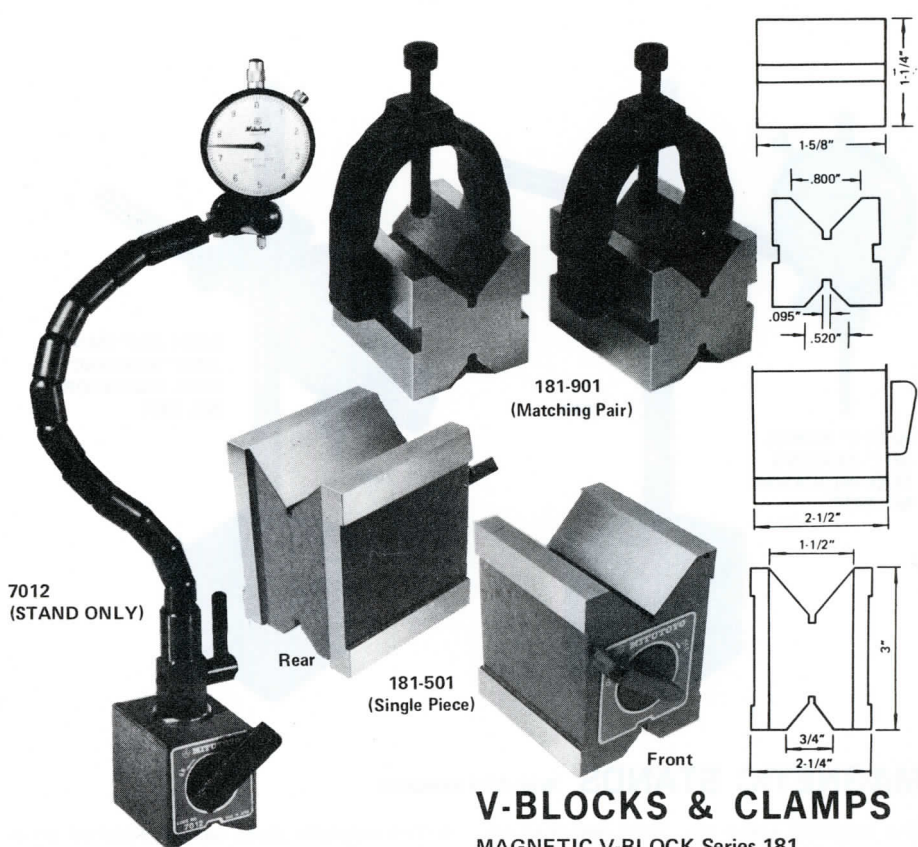
MAGNETIC STANDS With Dial Indicator

The magnetic stand No. 7010 described on the preceding page is available with series 2 AGD dial indicators. No. 7046, which is supplied with 1" travel .001" reading indicator, is for general measuring purposes. No. 7045, with .050" range .0001" reading indicator, is for close tolerance work.

The permanent magnetic base is featured with On-Off lever. Mounting or dismounting the stand on the machine is easy and precise. No need to pull or force it, simply turn the lever to Off and take it away.

- The magnetic stand can be attached on a flat surface perpendicular or horizontally. Or, on cylindrical surfaces.
- Permanent magnet with On-Off lever.
- Choice of .001" or .0001" reading dial indicators.
- Post and arm fully chrome-plated.
- If fine adjustment is preferred, add Dial Holding Rod, part No. 952244 (6" long) or No. 952245 (12").

No.	Description	Dial Indicator	Range	Graduation
7045	Magnetic Stand No. 7010 and No. 2804 Indicator		0-.050"	.0001"
7046	Magnetic Stand No. 7010 and No. 2416 Indicator		0-1"	.001"



7012
(STAND ONLY)

Rear

181-501
(Single Piece)

Front

V-BLOCKS & CLAMPS

MAGNETIC V-BLOCK Series 181

Hardened and precision ground.

No. 181-901 is a matched pair, while

No. 181-501 is a single piece V-Block with 60 Kgf magnet.

FLEXI-STAND™

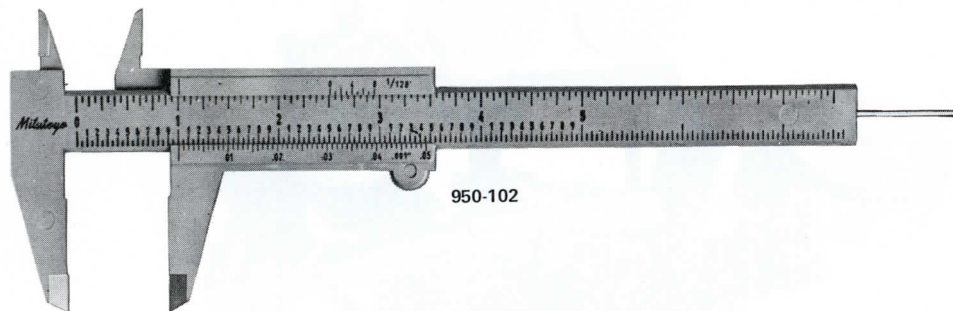
No. 7012 (Stand Only)

- Accepts all AGD 3/8" stems.
- Can be held by the lug on center. (Dial Indicators).
- Holds the Test Indicators by the stem.
- Overall length: Approx. 15".
- Permanent magnet with on-off lever.

- 90 degree Vees are parallel and square with the ends and sides.
- Clamping capacity for No. 181-901 is .200 to 1" with .0003" matched accuracy.

No.	Overall height
7012	approx. 15"

Size	No.	Accuracy
1-5/8 x 1-1/4 x 1-1/4"	181-901	.0003" (Matched)
3 x 2-1/2 x 2-1/4"	181-501	.0006" (Single)



950-102

PLASTIC VERNIER CALIPER

Metric Fractions, Thousandths, All In One Caliper.

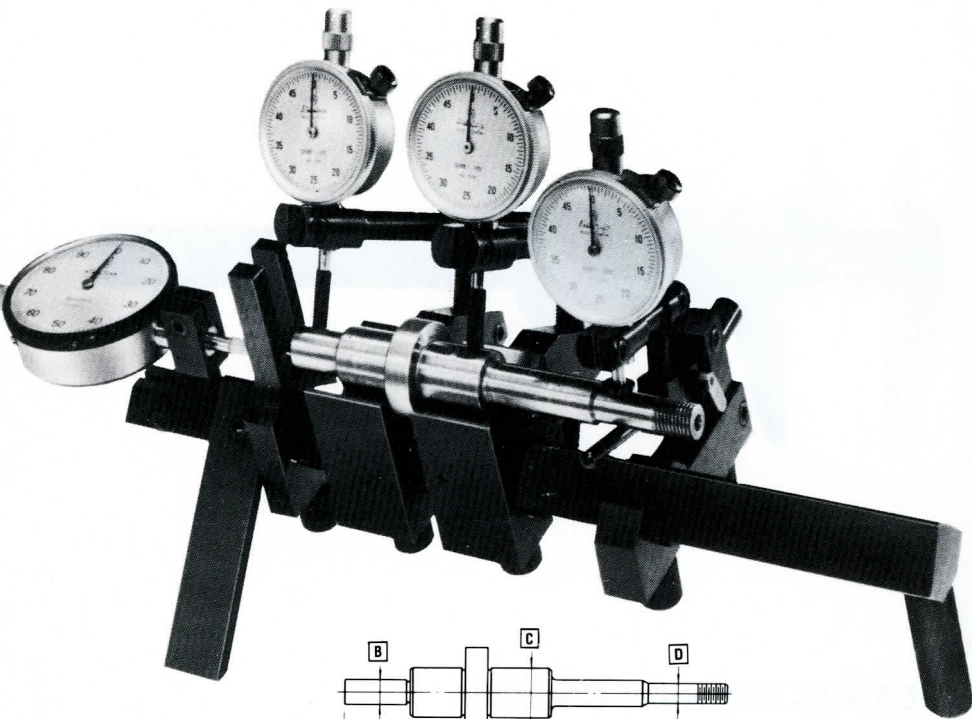
The MITUTOYO Plastic Vernier Caliper is a general purpose 5" x 120mm caliper providing inch fractions, inch decimals and metric scales all in one caliper. It is highly recommended for vocational students, machinist apprentices, hobbyists and many others who are interested in knowing the basic of Vernier Caliper and its applications.

The caliper measures inside, outside and depth dimensions plus from an edge to a shoulder. It comes with an instruction manual describing how those four dimensions are measured. The manual also shows how to read each scale.

The Plastic Caliper is equipped with thumb roller for coarse and fine adjustments. The depth bar is a metal rod of approximate .058" diameter, and this is the only metal part used in the caliper.

- Inch fractions, inch decimals and metric scales in one caliper.
- Inside, outside, depth and step measurements all featured.
- Durable plastic lasts for many years.
- Supplied with an operation manual.

Range	No.	Graduation
5" x 120mm	950-102	.001" x 1/128"



MULTI-STAND^{T.M.}

ADVANTAGES OF MULTI-STAND

- Use for inspection at point of machining or grinding
- Helps inspector to accurately check parts in production
- Increases production by alerting operator when tools need sharpening
- Helps eliminate defective parts
- Several measurements can be made at one time: gaging diameter, concentricity, length, in a single operation
- Easy to use — avoids complexity of hand-held instruments.

A — INDICATOR MEASURES LENGTH AND LOCATION

Indicator at end of beam is used for measuring length and location. This indicator can be raised or lowered to desired height. Guard is used as a reference point in checking lengths and location of grooves, cross holes, steps, etc., also to protect indicator.

B — INDICATOR MEASURES CONCENTRICITY

V-Block with indicator mounted perpendicular to front angle of V-Block for checking diameter and concentricity. The indicator is set on a threaded holder for raising and lowering as needed. V-Block has a slot and pin hole used for stops on lengths and grooves.

C — INDICATOR MEASURES DIAMETERS

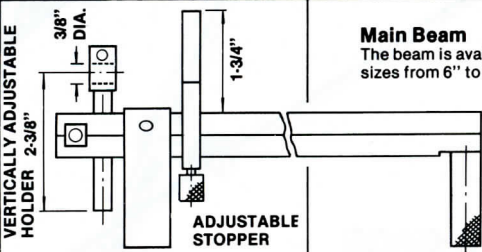
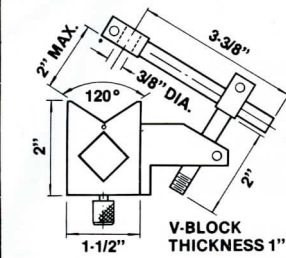
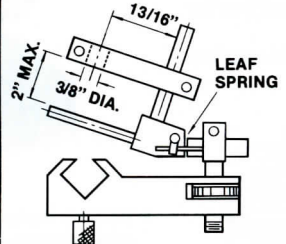
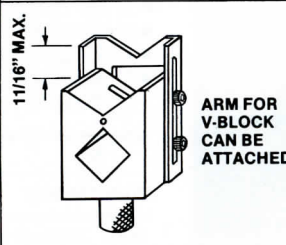
Same as "A" except indicator is directly over V-Block and work piece, resulting in checking diameters.

D — FLOATING INDICATOR GAGE

Floating snap-type indicator gage for checking additional diameter and concentricity without the use of V-Blocks. This unit is spring-loaded, allowing it to float — Unit has 2 position control lever.



MULTI-STAND SECTION GUIDE

		DIMENSIONS	DESCRIPTIONS
Length	No.		Main Beam The beam is available in six sizes from 6" to 36" long
6"	050076		
12"	050077		
18"	050078		
24"	050079		
30"	050080		
36"	050081		
Description	No.		V-Block & Arm 120° V-Block, block thickness 1", the maximum diameter measurable is approx. 2". The holding arm with 3/8" dia. bore accepts all AGD type probes.
V-Block and Arm Complete	050071		
V-Block only	050070		
Arm only	050075		
Description	No.		Floating Arm Assembly Spring loaded, snap-type floating arm assembly with 2 positions. Moving the small lever to vertical position results in checking diameters—moving the lever to horizontal position results in checking concentricity.
Floating Arm Assembly	050072		
Description	No.		Elevating V-Block Position of the V can be elevated to a maximum of 11/16". Thickness of the elevating V is 3/16". Arm for V-Block No. 050075 can be also used.
Elevating V-Block/Arm Complete	050073		
Elevating V-Block only	050074		
Arm only	050075		

SURFACE GAGE

No. 7030 (156-502)

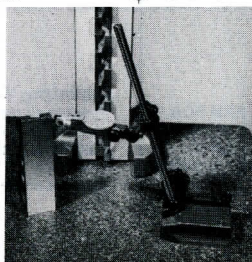
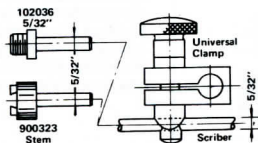
MITUTOYO surface gage **7030** consists of a 5/32" dia. 9" scribe, 5/16" dia. upright post which is also 9" tall, coarse adjusting clamp for upright post, fine-adjusting knob and wrinkle finished hardened steel base.

The two gage pins provided are held tightly against the base.

The rocker runs the entire length of the base and pivots against a heavy spring, allowing a wide range of fine adjustment, yet holding the tip of the scribe firmly.

Use of test indicator along with this surface gage is recommended.

Stems for Test Indicators



In addition to the above stems for test indicators, the new **156-502** surface gage accepts 3/8" DIA. stem **953071**.

7030

156-502

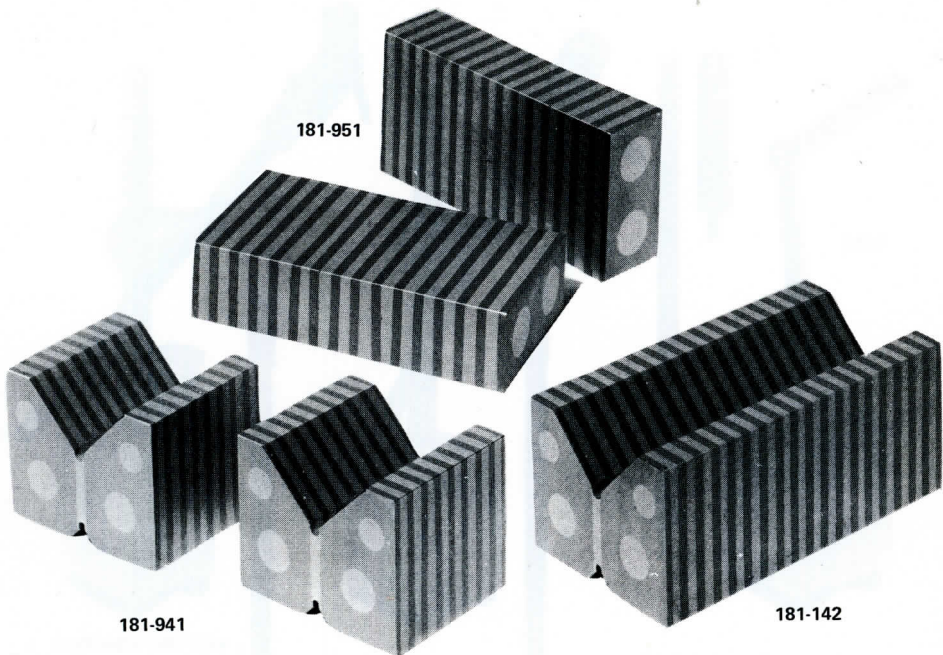
- Bottom surface, Vee and parallel side edges are ground.
- A pair of gage pins for linear work.
- Supplied with 9" scribe.
- Fine adjusting knob.
- Suitable as a small transfer stand with MITUTOYO test indicator.

No.	Spindle	Base
7030(156-502)	9"	3-5/16 x 2-3/8"

Note: **7030** will be superseded by **156-502**.



181-951



181-941

181-142

MICRO PARALLELS & UNIVERSAL V-BLOCKS (for magnetic chuck) Series 181

The steel used in all V-Blocks and Parallels is selected for the highest magnetic transfer, and is cast integrally with aluminum.

The V-Blocks and Parallels transfer the magnetism from permanent magnetic chucks.

Available only in matched pairs, except single V-Block 181-142.

- Holds work in any direction on magnetic chucks.
- Cast integrally with aluminum.
- Serial number etched on matched pairs.
- V-Blocks have two 90 deg. V-Grooves.
- Patented process used in production.
- Packed in a fitted wooden case.



181-961

All micro parallels and V-Blocks are supplied with fitted wooden case. No. 181-961 shown here is combination of No. 181-941 and No. 181-951.

No.	Size	Note
181-941	1-7/8 x 2-3/8 x 2"	Serialized in pairs (two 90 deg. Vees)
181-142	1-7/8 x 2-3/8 x 4-3/8"	Single V-Block (two 90 Deg. Vees)
181-951	1 x 2 x 4"	Serialized in pairs
181-961	(see 181-941, 951)	Serialized in pairs (Combination set)



MINI-MAGNETIC STANDS

MITUTOYO's Mini-Magnetic Stands are designed to provide on-the-job convenience for tool and die makers, machinist, inspectors and many others who use the indicators to check work tolerances. Powerful permanent magnetic securely holds MITUTOYO test indicators 513 series and/or AGD dial indicators in a required gaging position.

No. 7022 & 7023

For MITUTOYO and other test indicators. .234" dia. rod dimension is specially selected to allow two MITUTOYO test indicator clamps No. 900291 and No. 900322. Supplied with 5/16" dia., 1½" long extra rod for other clamps, and .217" dia., 4-3/8" long extension rod.

No. 7020 & 7021

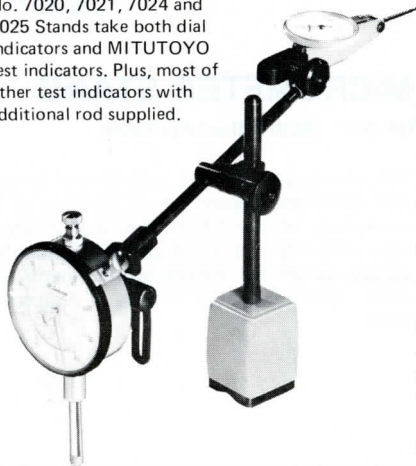
For all AGD dial indicators (with standard lug on center back) and MITUTOYO and other test indicators. One end of the rod is designed to hold dial indicator's back (lug on center), and the opposite end with .234" OD. is for No. 900291 and No. 900322 test indicator's clamp.

Additional rod with 5/16" and 7/32" dia. is also supplied.





No. 7020, 7021, 7024 and 7025 Stands take both dial indicators and MITUTOYO test indicators. Plus, most of other test indicators with additional rod supplied.



7025
with fine adjustment

MINI-MAGNETIC STANDS

Most complete heavy-duty type for all dial indicators and test indicators available in the market. The furnished rod has .234" OD. for MITUTOYO test indicator's clamp on one end, while the other has a clamp for dial indicators. Additional rod is provided for a greater versatility. One end has 7/32" OD. (.218"), the other with 5/16" OD. (.312"). The extra rod is for other clamps usually available in the machine shop. Both models come with a convenient lever to detach permanent magnet from the surface. Vee channel on the magnet allows use on round or flat surfaces.

Code No.	Note	Rod Diameters
7022	For Test Indicators	.234", 7/32", 5/16"
7023	For Test Indicators	.234", 7/32", 5/16"
7020	For Dial & Test Indicators	.234", 7/32", 5/16" and Clamp
7021	For Dial & Test Indicators	.234", 7/32", 5/16" and Clamp
7024	For Dial & Test Indicators	.234", 7/32", 5/16" and Clamp
7025	For Dial & Test Indicators	.234", 7/32", 5/16" and Clamp



156-101



156-201

MICROMETER STAND

156-101

This Micrometer Stand becomes a necessary clamping device when more precise measurements are required. It provides a desirable measuring position and angle for Inside and Outside Micrometers, Dial Snap Gages, Snap Meters, Indicating Micrometers and many other instruments.



MICROMETER STAND

156-201 (With Adjustable Table)

The clamp position can be adjusted forward and backward depending on the size of the workpiece on the table. The table is adjustable vertically and is clamped by a knob. It is ideally suited for thread measurements and other specimens that require a supporting table.

No.	Description
156-101	Micrometer Stand
156-201	Micrometer Stand with adjustable table



DIAL GAGE STAND No. 7003

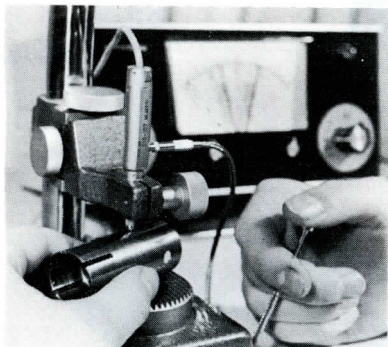
The compact and versatile Dial Gage Stand No. 7003 is a commonly-used, general-purpose stand for comparison measurements. It has a 5" maximum-height capacity, and features a wide fine-adjusting range for zero-setting gage heads. The Stand is designed for AGD type probes with 3/8" DIA. stems, and accommodates all AGD type dial indicators. It is ideal for general use.

The Stand is furnished with a serrated base-anvil (No. 101462). If this anvil is not suitable for certain gaging operations, it can be interchanged with either of two optional base-anvils, shown below.

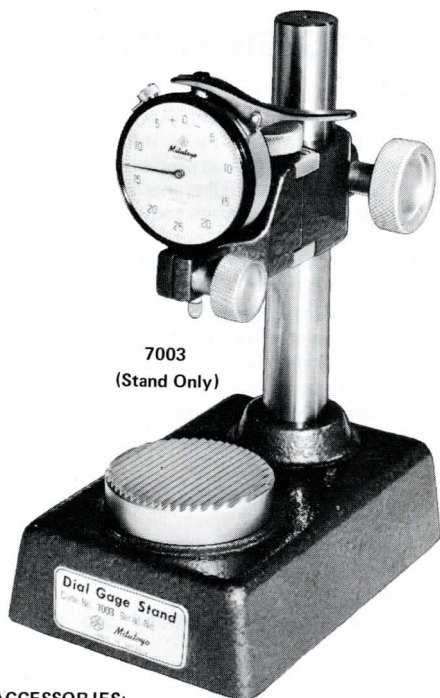
Accessories and Parts

- 101461 Flat Anvil
- 101462 Serrated Anvil - Furnished
- 101463 Domed Anvil
- 101464 Set of three screws to secure anvils.

Application Example

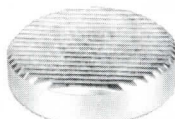


MITUTOYO Mu-Checker and Cartridge Head used, with Dial Gage Stand, to check close-toleranced parts.



7003
(Stand Only)

ACCESSORIES:



101462

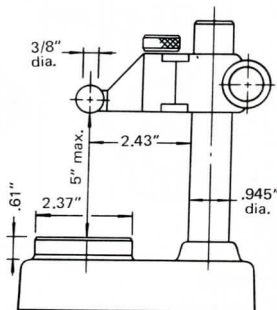


101463



101461

DIMENSIONS:

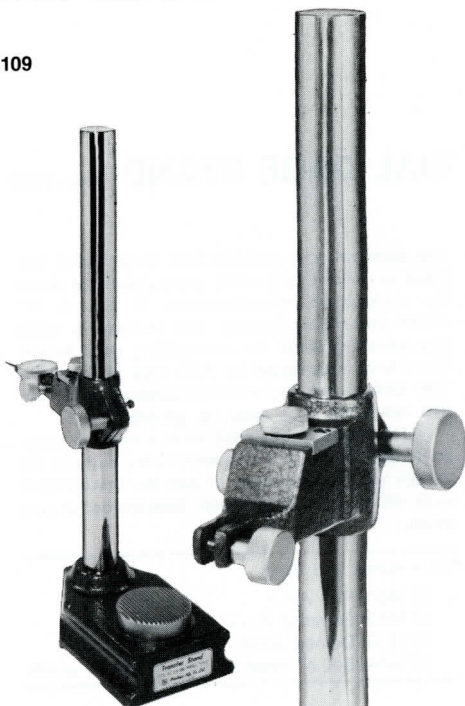


	No.	Ht. Capacity	Base	Remarks
Dial Gage Stand	7003	5"	Serrated Anvil	For AGD type probes with 3/8" dia. stem

TRANSFER STAND No. 519-109

This stand was specially designed for our electronic gaging system Mu-Checker which is designed to measure in millionths. Frequent requests for this precision stand have encouraged us to make this STAND available to you as a separate tool.

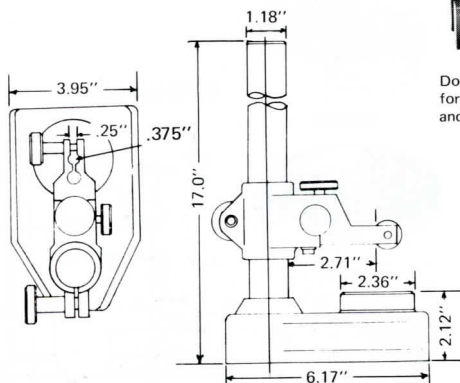
- Can be used with any A.G.D. Dial Test Indicator or A.G.D. Dial Indicator.
- Big, sturdy enameled cast iron base; stainless steel ground post mounted at perfect right angles to the base.
- Rapid preliminary positioning with the coarse adjustment knob.
- Fine adjustment knob on the stand head for "o" settings.
- Universal adjustment in horizontal planes.
- The arm is easily rotated to position the gage head over the surface plate or the anvil.
- Base is precision ground and micro-lapped.
- Supplied with serrated Anvil (101462) can be interchanged with Flat (101461) and Domed (101463) Anvils.



390070

Dovetail attachment
for Test Indicators
and Lever Head.

519-109



PARTS

101461	Anvil, Flat
101462	Anvil, Serrated
101463	Anvil, Domed
101464	3 Anvil Screws
390070	Dovetail Attachment

No.	Description
519-109	Transfer Stand with Serrated Anvil(101462)



TRANSFER STAND

NO. 7005

Heavy Duty Type

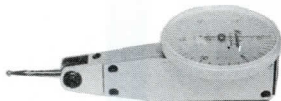
The heavy-duty, 18" capacity, Transfer Stand is designed to transfer known heights to unknown workpieces, or vice versa, on a surface plate reference.

The Stand may be used with an electronic amplifier, such as a Mu-Checker, or a high magnification test indicator, as illustrated below. The holding attachment, (optional accessory No. 390070) shown here, is for MITUTOYO Test Indicators with dovetails.

The fine adjusting knob, always required when gaging close-toleranced workpieces, is located on the base for easy reach and control. The mounted gage head can be directed anywhere within a wide 240 degree angular-range.

The Lever Head 519-106 and Cartridge Head 519-107 are mounted directly to the Transfer Stand. All MITUTOYO Test Indicators with dovetails require Special clamp 390070, shown below.

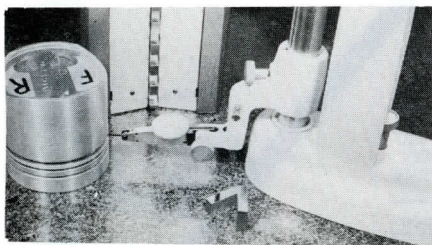
513-202



390070



Application Example



7005
Stand only

Fine Adjust
Knob

	No.	Ht. Capacity	Mount	Remarks
Transfer Stand	7005	18"	3/8" dia. AGD Probes	with Fine Adjust Knob



187-904

Height Gage
Attachment Clamp
950749187-105 Acute
angle attachment

UNIVERSAL BEVEL PROTRACTORS Series 187

MITUTOYO Universal Bevel Protractor Series 187 is the ideal tool for inspection, machine drawing jobs, for checking of angles and layout. Made of hardened stainless steel, it can be set at 5 minute intervals by a fine adjustment knob. The satin-chrome finished dial face has clear and crisp graduations. The Installed Magnifier Lens permits more accurate, easier and faster reading. Dial reading from 0-90, 90-0, 0-90, 90-0 around 0-360 degree. The Protractor Head accepts both 6" and 12" Blades.

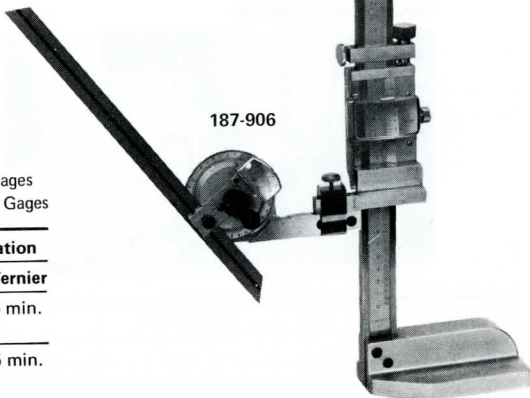
- Hardened stainless steel, rust and wear resistant for long life.
- Flush-reading, no parallax error, gives a high degree of accurate measurements.
- With Magnifier glass for easier and faster reading.
- Attachment Clamp 950749 for Inch Height Gages is supplied.
- Fine adjustment knob for measuring or setting of minute angles.
- Positive rigid locking clamps.

ACCESSORIES AND PARTS:

No.

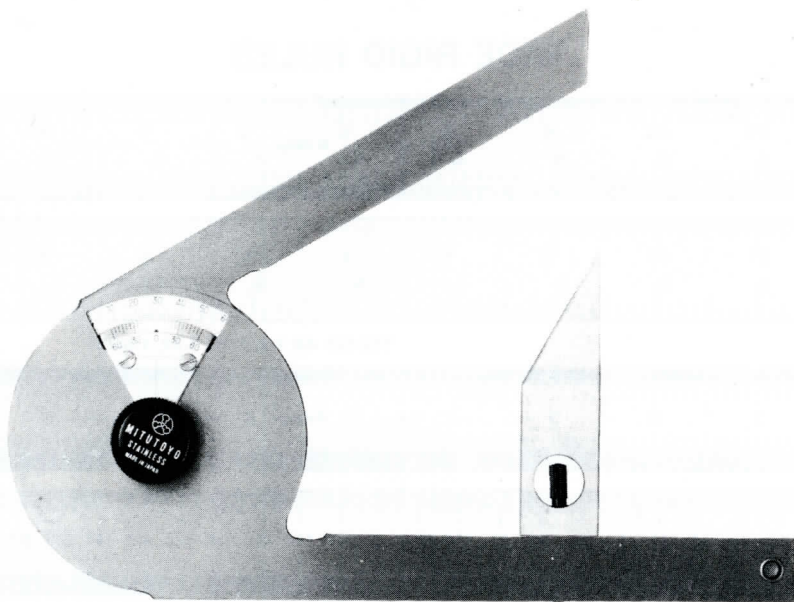
187-103	12" Blade
187-104	6" Blade
187-105	Acute angle attachment
950749	Attachment Clamp for Inch Height Gages
950750	Attachment Clamp for Metric Height Gages

For more precise angle measurements, the Protractor can be attached to MITUTOYO Height Gages. A clamp for this is furnished with the case.



187-906

No.	Description	Graduation	
		Dial	Vernier
187-904	with 6" Blade and Height Gage attachment clamp	1°	5 min.
187-906	with 12" Blade and height Gage attachment clamp	1°	5 min.



187-201

BEVEL PROTRACTOR

Series 187

The bevel protractor consists of three sheets of stainless steel, the middle one which is made movable for angle measurements.

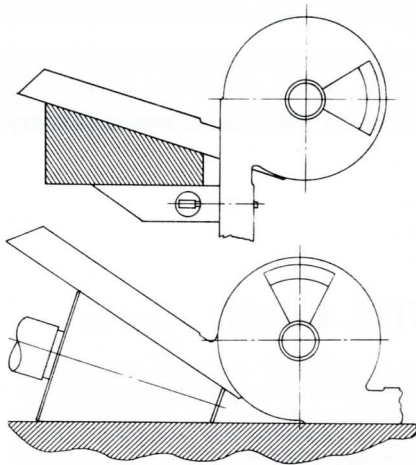
The protractor is graduated in one degree increments of 360 degrees.

The vernier reads to 5 minutes or $1/2$ of a degree. The center black knob locks the blade position.

The blade is $5-3/8''$ long, and is an integral part of the protractor graduations.

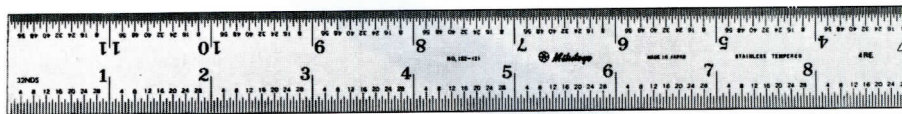
The beam is $5-7/8''$ long and comes with a detachable acute angle attachment.

- Reads to 5 minutes with vernier.
- Made of stainless steel throughout.
- With acute angle attachment.
- Protractor graduation $0-90^{\circ}$, $90-0^{\circ}$, $0-90^{\circ}$, $90-0^{\circ}$.

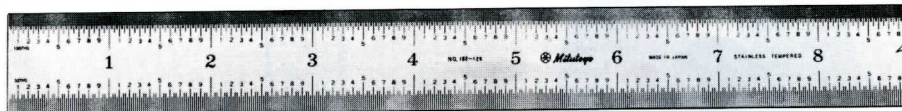
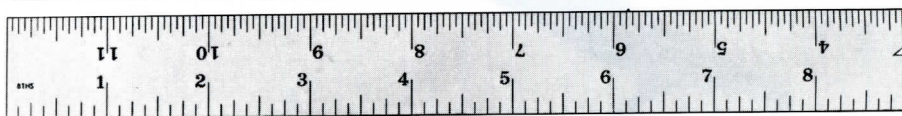


No.	Description	Graduation
187-201	Bevel Protractor	1 deg./5 min.

WIDE RIGID RULES



182-121 4R 1/8, 1/16, 1/32, 1/64ths



182-126 1/50, 1/100ths, 1, 1/2mm



182-125 1/32, 1/64ths, 1, 1/2mm

STEEL RULES Series 182

Made of tempered steel and satin-chrome finished. MITUTOYO Steel Rules are extremely durable for everyday use. Graduations are marked on glare-free satin chromed surface, and are deeply photoengraved for longer tool life.

MITUTOYO offers a wide variety in inch, inch/metric and metric only rules. Both rigid and full-flexible rules are available.

- All MITUTOYO Steel Rules meet Federal Specifications.
- 3R—1/32, 1/64, 1/10, 1/50ths graduations.
- 4R—1/8, 1/16, 1/32, 1/64ths graduations.
- 5R—1/32, 1/64, 1/10, 1/100ths graduations.
- 16R—1/32, 1/64, 1/50, 1/100ths graduations.

**STEEL RULES** Series 182**Wide Rigid Rules**

Type	No.	Size	Graduations				Width	Thickness
Inch	182-101	6" (4R)	1/8	1/16	1/32	1/64th	3/4"	3/64"
	182-102	6" (16R)	1/32	1/64	1/50	1/100th	3/4"	3/64"
	182-103	6" (5R)	1/32	1/64	1/10	1/100th	3/4"	3/64"
	182-104	6" (3R)	1/32	1/64	1/10	1/50th	3/4"	3/64"
Inch/Metric	182-105	6" x 150mm	1/32	1/64	1mm	1/2mm	3/4"	3/64"
Inch/Metric	182-106	6" x 150mm	1/50	1/100	1mm	1/2mm	3/4"	3/64"
Inch/Metric	182-107	6" x 150mm	1/10	1/100	1mm	1/2mm	3/4"	3/64"
Inch/Metric	182-108	6" x 150mm	1/10	1/50	1mm	1/2mm	3/4"	3/64"
Metric only	182-111	150mm	1mm	1/2mm	1mm	1/2mm	3/4"	3/64"
Inch	182-121	12" (4R)	1/8	1/16	1/32	1/64th	1"	3/64"
	182-122	12" (16R)	1/32	1/64	1/50	1/100th	1"	3/64"
	182-123	12" (5R)	1/32	1/64	1/10	1/100th	1"	3/64..
	182-124	12" (3R)	1/32	1/64	1/10	1/50th	1"	3/64"
Inch/Metric	182-125	12" x 300mm	1/32	1/64	1mm	1/2mm	1"	3/64"
Inch/Metric	182-126	12" x 300mm	1/50	1/100	1mm	1/2mm	1"	3/64"
Metric only	182-131	300mm	1mm	1/2mm	1mm	1/2mm	1"	3/64"
Inch	182-241	18" (4R)	1/8	1/16	1/32	1/64th	1-3/64"	3/64"
	182-142	18" (16R)	1/32	1/64	1/50	1/100th	1-3/64"	3/64"
	182-143	18" (5R)	1/32	1/64	1/10	1/100th	1-3/64"	3/64"
	182-144	18" (3R)	1/32	1/64	1/10	1/50th	1-3/64"	3/64"
Inch/Metric	182-145	18" x 450mm	1/32	1/64	1mm	1/2mm	1-3/64"	3/64"
Metric only	182-151	450mm	1mm	1/2mm	1mm	1/2mm	1-3/64"	3/64"
Inch	182-161	24" (4R)	1/8	1/16	1/32	1/64 th	1-3/64"	3/64"
	182-162	24" (16R)	1/32	1/64	1/50	1/100th	1-3/64"	3/64"
	182-163	24" (5R)	1/32	1/64	1/10	1/100th	1-3/64"	3/64"
	182-164	24" (3R)	1/32	1/64	1/10	1/50th	1-3/64"	3/64"
Inch/Metric	182-165	24" x 600mm	1/32	1/64	1mm	1/2mm	1-3/64"	3/64"
Metric only	182-171	600mm	1mm	1/2mm	1mm	1/2mm	1-3/64"	3/64"

Full-Flexible Rules

Inch	182-201	6" (4R)	1/8	1/16	1/32	1/64th	1/2"	1/64"
	182-202	6" (16R)	1/32	1/64	1/50	1/100th	1/2"	1/64"
	182-203	6" (5R)	1/32	1/64	1/10	1/100th	1/2"	1/64"
	182-204	6" (3R)	1/32	1/64	1/10	1/50th	1/2"	1/64"
Inch/Metric	182-205	6" x 150mm	1/32	1/64	1mm	1/2mm	1/2"	1/64"
Inch/Metric	182-206	6" x 150mm	1/50	1/100	1mm	1/2mm	1/2"	1/64"
Inch/Metric	182-207	6" x 150mm	1/10	1/100	1mm	1/2mm	1/2"	1/64"
Inch/Metric	182-208	6" x 150mm	1/10	1/50	1mm	1/2mm	1/2"	1/64"
Metric only	182-211	150mm	1mm	1/2mm	1mm	1/2mm	1/2"	1/64"

(Continued Next Page)

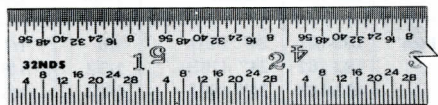
Full-Flexible Rules

Type	No.	Size	Graduation				Width	Thickness
Inch	182-221	12" (4R)	1/8	1/16	1/32	1/64th	1/2"	1/64"
	182-222	12" (16R)	1/32	1/64	1/50	1/100th	1/2"	1/64"
	182-223	12" (5R)	1/32	1/64	1/10	1/100th	1/2"	1/64"
	182-224	12" (3R)	1/32	1/64	1/10	1/50th	1/2"	1/64"
Inch/Metric	182-225	12" x 300mm	1/32	1/64	1mm	1/2mm	1/2"	1/64"
Inch/Metric	182-226	12" x 300mm	1/50	1/100	1mm	1/2mm	1/2"	1/64"
Metric only	182-231	300mm	1mm	1/2mm	1mm	1/2mm	1/2"	1/64"
Inch	182-241	18" (4R)	1/8	1/16	1/32	1/64th	3/4"	1/64"
	182-242	18" (16R)	1/32	1/64	1/50	1/100th	3/4"	1/64"
	182-243	18" (5R)	1/32	1/64	1/10	1/100th	3/4"	1/64"
	182-244	18" (3R)	1/32	1/64	1/10	1/50th	3/4"	1/64"
Inch/Metric	182-245	18" x 450mm	1/32	1/64	1mm	1/2mm	3/4"	1/64"
Metric only	182-251	450mm	1mm	1/2mm	1mm	1/2mm	3/4"	1/64"
Inch	182-261	24" (4R)	1/8	1/16	1/32	1/64th	3/4"	1/64"
	182-262	24" (16R)	1/32	1/64	1/50	1/100th	3/4"	1/64"
	182-263	24" (5R)	1/32	1/64	1/10	1/100th	3/4"	1/64"
	182-264	24" (3R)	1/32	1/64	1/10	1/50th	3/4"	1/64"
Inch/Metric	182-265	24" x 600mm	1/32	1/64	1mm	1/2mm	3/4"	1/64"
Metric only	182-271	600mm	1mm	1/2mm	1mm	1/2mm	3/4"	1/64"

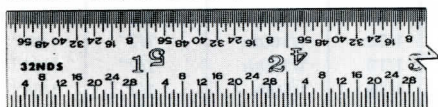
FULL FLEXIBLE RULES



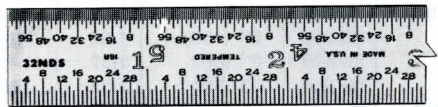
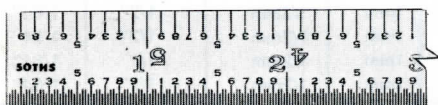
182-205 1/32, 1/64ths, 1, 1/2mm



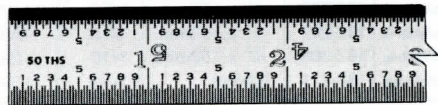
182-206 1/50, 1/100ths, 1, 1/2mm

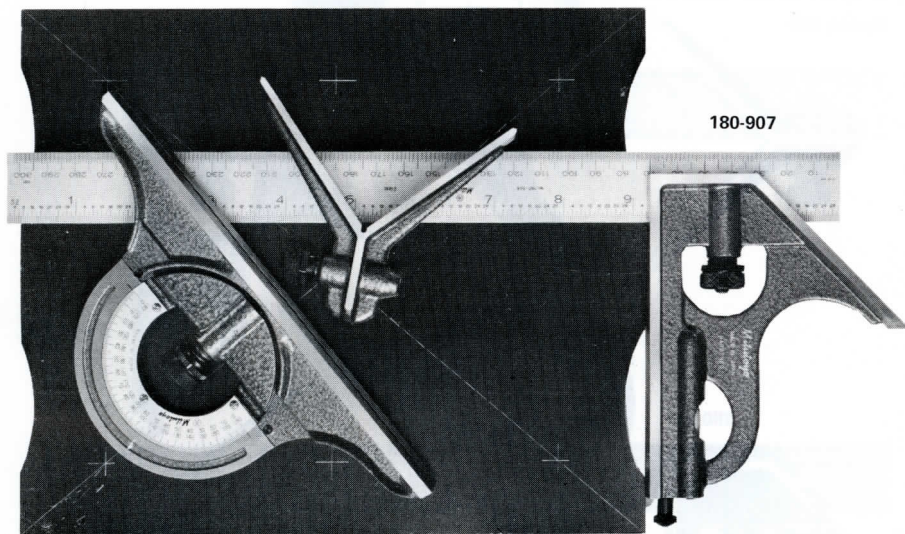


182-204 3R 1/32, 1/64, 1/10, 1/50ths



182-202 16R 1/32, 1/64, 1/50, 1/100ths



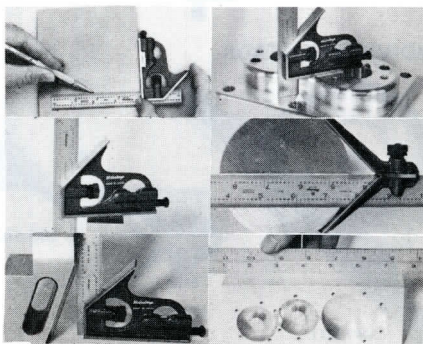


Combination Square Set No. 180-907 consists of: 12"/300mm Blade (180-503), Protractor Head (180-301), Center Head (180-202) and Square Head (180-102).

COMBINATION SQUARE SETS Series 180

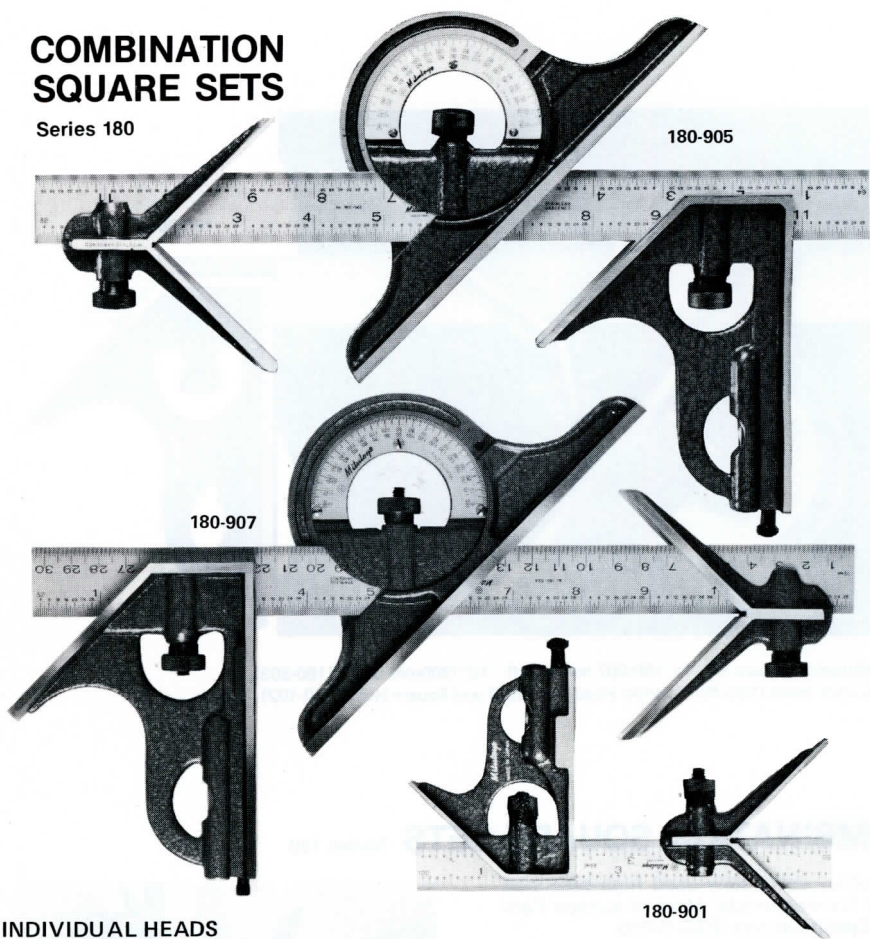
Versatile, universally-used high-precision tools for machinists. Meet or exceed Federal Specifications GGG-S-656.

- Hardened combination blades—satin-chrome finished for resistance to stains and corrosion, and, for sharp, glare-free graduations.
- Square heads and center heads—forged steel, hardened and ground. Square heads with spirit levels and hardened scribe-points.
- Protractor heads—reversible with spirit levels. All, made of cast iron—hardened and ground—have dual, full 180° graduations.

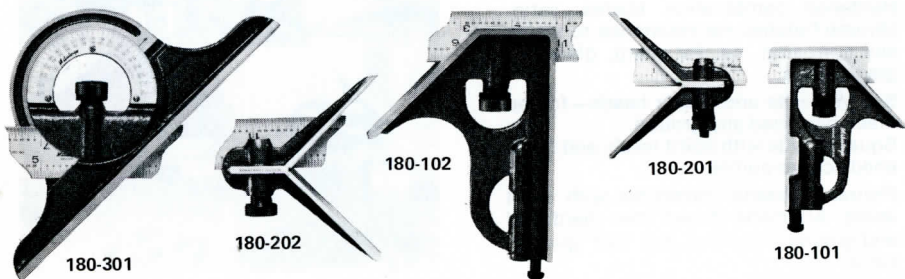


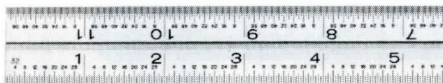
COMBINATION SQUARE SETS

Series 180

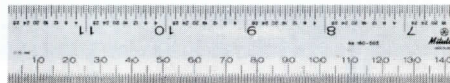


INDIVIDUAL HEADS

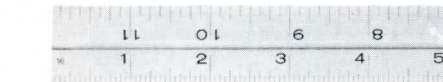




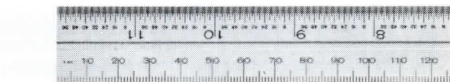
180-501 (4R)



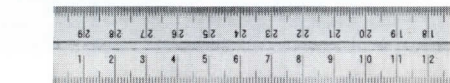
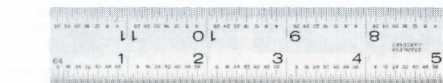
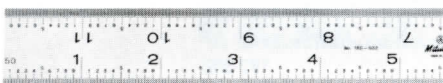
180-503



180-502 (16R)



180-505



Parts	No.	Description
	990003	Clamp for 12" and 24" Square & Center Heads
	990009	Clamp for 6" Square & Center Heads
	990010	Clamp for 6" Center Head
	990011	Clamp for Protractor Head
	990005	Scriber for 12" and 24" Square Head
	990006	Scriber for 6" Square Head

BLADE ONLY

No.	Length	Graduations
180-401	6"	8, 16, 32, 64ths (4R)
180-402	6"	32, 64, 50, 100ths (16R)
180-403	6"x150mm	32, 1/2mm, 64, 1mm
180-405	150mm	1, 1/2, 1, 1/2mm
180-501	12"	8, 16, 32, 64ths (4R)
180-502	12"	32, 64, 50, 100ths (16R)
180-503	12"x300mm	32, 64ths, 1, 1/2mm
180-505	300mm	1, 1/2, 1, 1/2mm
180-701	18"	8, 16, 32, 64ths (4R)
180-702	18"	32, 64, 50, 100ths (16R)
180-703	18"x450mm	32, 64th, 1, 1/2mm
180-705	450mm	1, 1/2, 1, 1/2mm
180-601	24"	8, 16, 32, 64ths (4R)
180-602	24"	32, 64, 50, 100ths (16R)
180-603	24"x600mm	32, 64ths, 1, 1/2mm
180-605	600mm	1, 1/2, 1, 1/2mm

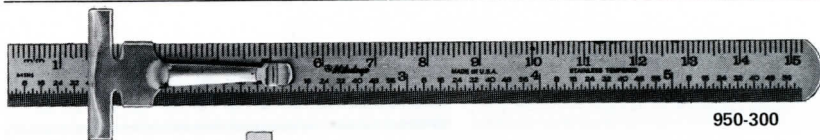
HEAD ONLY

No.	Description
180-101	Square Head for 6" models
180-102	Square Head for 12" & 24" models
180-201	Center Head for 6" models
180-202	Center Head for 12" & 24" models
180-301	Protractor Head for 12" & 24" models

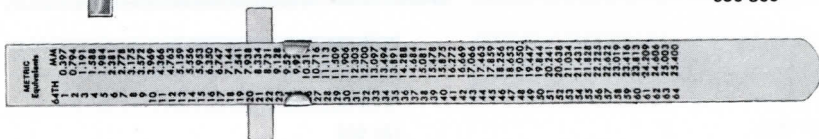
COMBINATION SQUARE SETS

Series 180

	Set No.	Blade	Square Head	Center Head	Protractor Head
Inch	180-901	6" 4R 180-401	180-101	180-201	
	180-902	6" 16R 180-402	180-101	180-201	
	180-903	12" 4R 180-501	180-102	180-202	
	180-904	12" 16R 180-502	180-102	180-202	
	180-905	12" 4R 180-501	180-102	180-202	180-301
	180-906	12" 16R 180-502	180-102	180-202	180-301
Inch/Metric	180-907	12"/300mm 180-503	180-102	180-202	180-301
Metric only	180-910	300mm 180-505	180-102	180-202	180-301



950-300



182-302



182-305

STEEL RULES Series 182

Semi flexible steel rules, front side only.

Metric and Inch graduations are engraved on the front side only. Reverse side of these rules are without graduations. The rules are satin chrome finished for positive, non-glare readings.

Graduations are photo engraved for maximum uniformity. They are made of tempered stainless steel, and are highly suited for measurements of round, concave or distorted workpieces as well as straight dimensions.

- Fully flexible tempered stainless.
- Metric/Inch dual graduations.
- Convenient hole to hang the rule.
- Glare-free, satin chrome finish.
- Crisp, clear graduations.
- Rule width:
 - 182-301, 182-302 --13mm
 - 182-304, 182-305 --15mm
 - 182-307, 182-309 --15mm

POCKET STEEL RULE

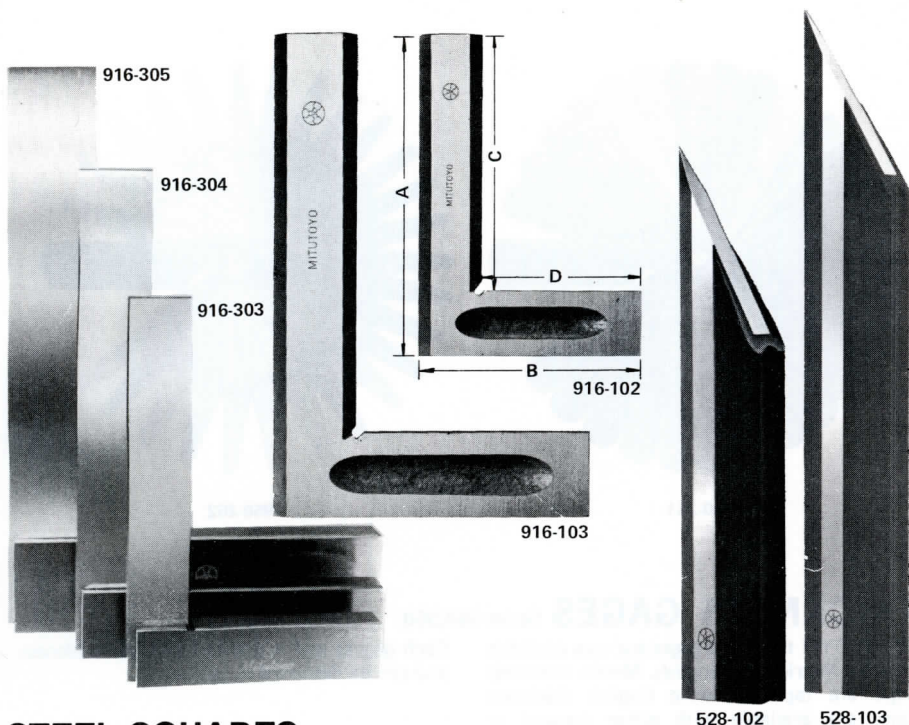
Series 950

A handy 6" x 150mm pocket steel rule is made of tempered stainless steel and satin chromed for glare-free readings.

English graduations are in 64ths, and metric scale is in 1mm increments. Convenient pocket clip is attached to the rule. One end of the rule is rounded so that even frequent use of the rule will not damage the pocket.

- Made of tempered stainless steel
- 6" x 150mm English and Metric, reading to 64th or 1mm.
- Reversed side of the rule shows metric equivalent of each Inch 64th fraction.
- Satin chromed for glare-free readings.
- Comes with a paper board, ready for peg board display (highly recommended to industrial distributors and hardware stores)
- Rule width .470", thickness .021"

Size	No.	Graduation	Remarks
100mm x 4"	182-301	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
150mm x 6"	182-302	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
250mm x 10"	182-304	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
300mm x 12"	182-305	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
500mm x 20"	182-307	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
1000mm x 40"	182-309	½, 1mm, 32nds, 64ths, 16ths.	Satin chrome finish
150mm x 6"	950-300	1mm, 64ths	With pocket clip



STEEL SQUARES Series 916

Regular type and beveled-edge type squares are available from MITUTOYO.
All edges are hardened and precision ground.

Beveled Edge Squares

Size	No.	A x B	Squareness
3"	916-101	3" x 2"	$\pm .00011"$
4"	916-102	4" x 2-3/4"	$\pm .00012"$
6"	916-103	6" x 4"	$\pm .00014"$
8"	916-104	8" x 5"	$\pm .00018"$

Regular Squares

Size	No.	A x B	Squareness
6"	916-303	6" x 4"	.00032"
8"	916-304	8" x 6"	.00036"
10"	916-305	10" x 6-1/2"	.00040"
12"	916-306	12" x 8"	.00044"
16"	916-307	16" x 10"	.00052"

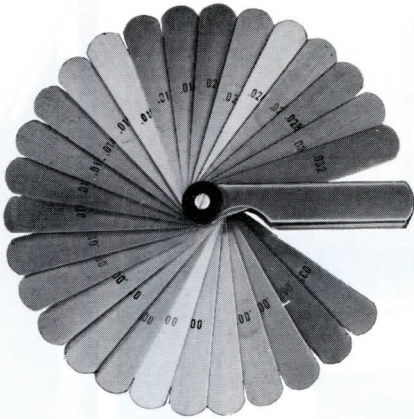
KNIFE EDGE STRAIGHT EDGE Series 528

The new MITUTOYO Knife Edge is used for detecting minute curvature or machining irregularities on flat surface.

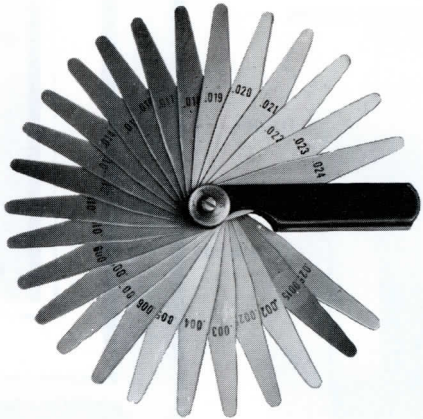
The testing edge is approximately .004" in thickness, a cross section of which has radius to provide a straight line contact with the work surface.

For ease of inspection, the blade is dyed in black, and the upper edge is covered with grip plate. The acute angle is 30 degrees.

Length	Code No.	Description
4"	528-102	with protective cover
6"	528-103	with protective cover
8"	528-104	with protective cover
10"	528-105	with protective cover



950-251



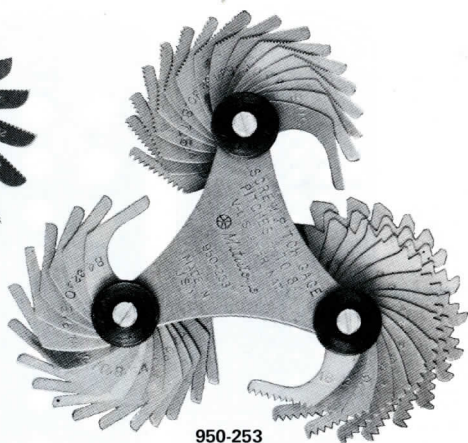
950-252

THICKNESS GAGES Series 184,950

MITUTOYO thickness gages are now available in both Metric and English. Metric thickness gages are tapered, while English thickness gages are available with either tapered or straight leaves.

Each gaging leaf is marked with its thickness, and can be detached if necessary.

	No.	Size Composition	No. of Leaves	Blades
Inch	184-101	.0015, .002, .003, .004, .006, .008, .010, .012, .015"	9	Tapered
	184-102	.004, thru .025" by .001" step	22	Straight
	184-405	.002, .003, .004, .005, .006, .008, .010, .012, .013, .015, .018, .019, .020, .022, .025"	15	Straight
	184-406	.0015 thru .0055" by .0005" step .006 thru .010" by .001" step. Plus, .012, .015, .020, .025"	18	Tapered
	950-251	.002 thru .018" by .001" step. Plus, .0015, .020, .022, .024, .025, .028, .030, .032, .035	26	Tapered
	950-252	.002 thru .025" by .001" step. Plus, .0025, .0015"	26	Tapered
Metric	184-302	0.03 thru 0.1mm by 0.01mm step. Plus, 0.15, 0.2, 0.3, 0.4, 0.5mm.	13	Tapered
	184-303	0.05 thru 0.14mm by 0.01mm step. Plus, 0.15 thru 1mm by 0.05mm step.	28	Tapered
	184-306	0.05 thru 0.2mm by 0.05mm step. Plus, 0.3 thru 0.8mm by 0.1mm step.	10	Tapered
	184-307	0.03 thru 0.1mm step. Plus, 0.15, 0.2, 0.3, 0.4, 0.5mm.	13	Tapered
	184-313	0.05 thru 0.14mm by 0.01mm step. Plus, 0.15 thru 1mm by 0.5mm step.	28	Tapered



RADIUS GAGES Series 186

INCH

Range	No.	No. of Leaves
1/32" - 1/4" by 64th	186-101	30
17/64" - 1/2" by 64th	186-102	32
1/32" - 17/64" by 64th	186-103	16
9/32" - 33/64" by 64th	186-104	16

METRIC

(Concave and Convex)

1-3mm by 0.25mm step	186-105	34
3.5-7mm by 0.5mm step		
7.5-15mm by 0.5mm step		
15.5-20mm by 0.5mm step	186-106	32
21-25mm by 0.1mm step	186-107	30
.4, .8, 1.0, 1.2, 1.5, 1.6, 1.75, 2.0, 2.25, 2.5, 2.75, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0mm	186-110	18

PITCH GAGES Series 188

- Pitch size stamped on each gage.
- Whitworth Unified and Metric Pitch Gages are available.

INCH

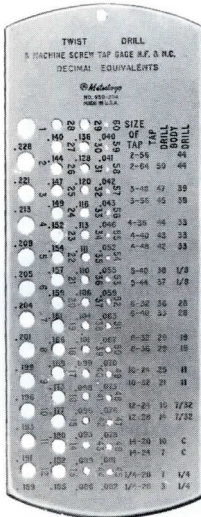
Range	No.	No. of Leaves	Description
4 - 42 TPI	188-101	30	Whitworth 55°
4 - 60 TPI	188-102	28	Whitworth 55°
4 - 42 TPI	188-111	30	Unified 60°
4 - 84 TPI	950-253	51	Unified 60°

METRIC

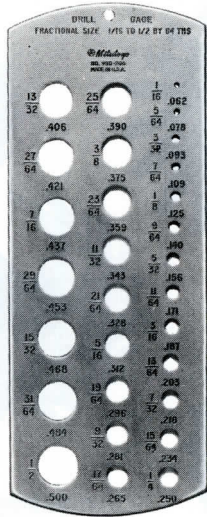
	No.
0.4, 0.5, 0.75, 1.0, 1.25	188-121
1.5, 1.75, 2.0, 2.5, 3.0	
3.5, 4.0, 4.5, 5.0, 5.5	
6.0, 6.5, 7.0mm (18 Leaves)	
Above 18 Leaves plus	188-122
0.7, 0.8, 0.9 (21 Leaves)	
4 - 42 TPI English (30 Leaves)	188-151
0.4 - 7mm Metric (21 Leaves)	

CENTER GAGE

950-201



950-204



950-206



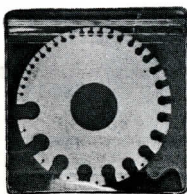
950-203

DRILL GAGE

Fractional size from 1/16" to 1/2" by 64ths. Total of 29 holes are marked with the drill size both in fractions and decimals. Approximate plate size is 6-3/8" by 2-1/2", thickness 5/64". This Drill Gage is durable enough for lifetime service. Dull chrome finish, and hardened.

TAP AND DRILL GAGE

This time saving gage shows the correct tap drill for National Fine or National Coarse thread series. The indicated size leaves right amount of stock for a 75% full thread. Example: a size NF 4-48 tap calls for a No. 42 tap drill and No. 33 body drill. Plate size approximately 6-3/8" by 2-1/2". Thickness 5/64". Dull chrome finish, and hardened.



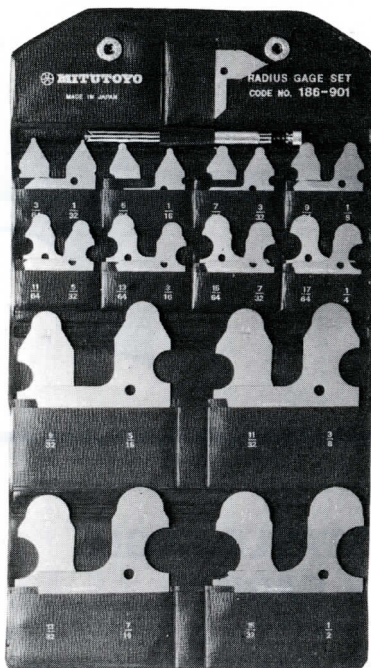
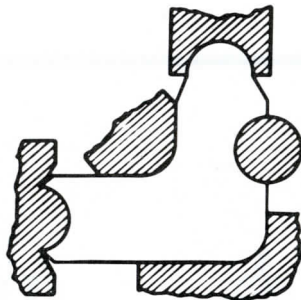
AMERICAN STANDARD WIRE GAGE

This numbered thickness standard is for non-ferrous metals such as copper, brass, aluminum, etc. Highly useful gage for finding wire, sheet or plate sizes. Each numbered slot has its decimal equivalent marked on the rear side. Approximate size 3-5/16", 1/10" thick, dull chrome finished and hardened.

U.S. STANDARD GAGE

This gage is for Sheet and Plate Iron and Steel. Time saving tool when a plate size must be quickly determined. Each numbered slot has its decimal equivalent marked on the rear side.

	Description	No.	Size
Inch	Tap and Drill Gage	950-204	Tap Size 2-56 to 1/4-28
	Drill Gage	950-206	Drill Size 1/16" to 1/2"
	Drill Gage	950-209	Drill Size A to Z
	Am. Standard Wire Gage	950-202	Gage No. 0 to 36
	U.S. Standard Gage	950-203	Gage No. 0 to 36
Metric	Drill Gage	950-207	1.5-12.5mm 30 holes
	Drill Gage	950-208	1.0-9mm 57 holes



186-901

RADIUS GAGE No. 186-901

Highly recommended for quick checking of radii ranging from 1/64th to 1/2 inch. Fractions only. Made of stainless steel with satin-chrome finish.

Each radius gage has five gaging surfaces as illustrated above, and comes etched with individual size.

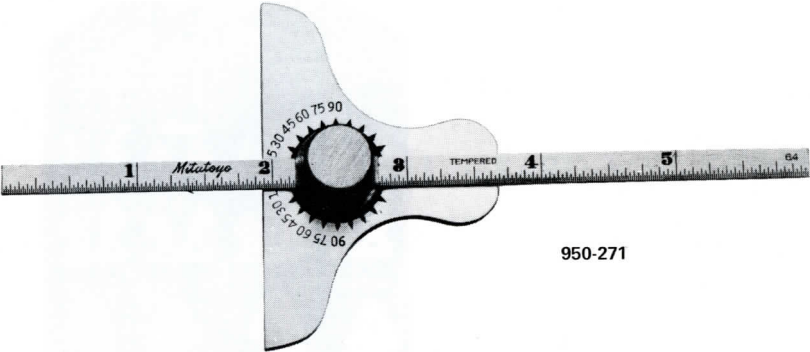
The holding case has indexed pocket. A holder is also provided for finer control of the small radius gages.

Parts: Holder 950753
All individual radius gages

Parts: Individual Radius Gages

Radius	Part No.	Radius	Part No.
1/64"	201444	7/32"	201454
1/32"	201442	15/64"	201455
3/64"	201443	1/4"	201456
1/16"	201441	17/64"	201457
5/64"	201445	9/32"	201458
3/32"	201446	5/16"	201459
7/64"	201447	11/32"	201460
1/8"	201448	3/8"	201461
9/64"	201449	13/32"	201462
5/32"	201450	7/16"	201463
11/64"	201451	15/32"	201464
3/16"	201452	1/2"	201465
13/64"	201453		

No.	Range	Number of Leaves
186-901	1/64 to 17/64 by 64th and 9/32 to 1/2 in. by 32nds	25



950-271

ADJUSTABLE ANGLE DEPTH GAGE

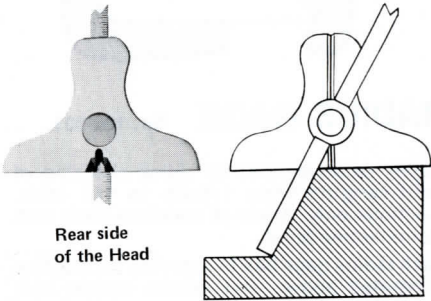
With 3/32" Depth Rod

The depth bar of this gage not only measures vertical depth as others do, but also indicates the angle in 15 degree increments.

The depth bar, which can be used as a narrow rule, is graduated in 64ths and 32nds. It is tempered, precision ground and has machine cut clear graduations.

The head is hardened, bright polished and grooved to hold 3/32" dia. rod. Narrow rule or rod is held under adjusting nut by spring tempered washer, which is notched to fit increment grooves in head.

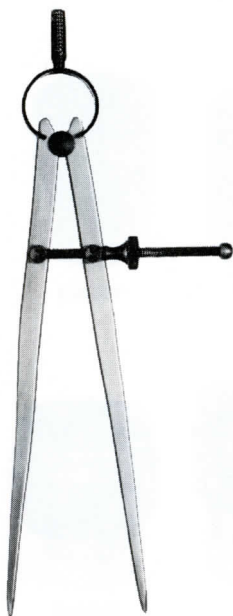
- Base Width: 2-9/16"
- Base Thickness: 1/8"
- Depth Bar: 6" 32nds, 64ths graduations
- Dimension: .218" x .040"
- Rod: 6", 3/32" (.094") dia.



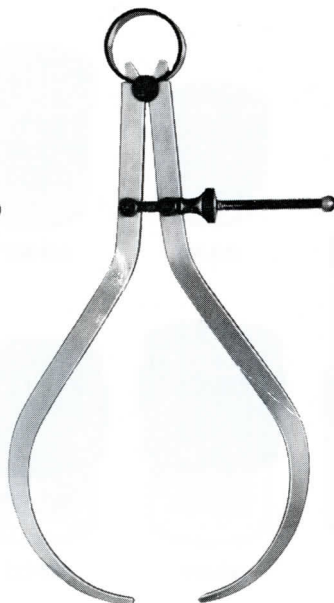
Rear side of the Head

Front side of the head has a V groove to hold depth rod in upright position. The Adjustable Angle Depth Gage is not precisely a protractor, but the angle measurement in 15° increment is a useful and welcomed feature.

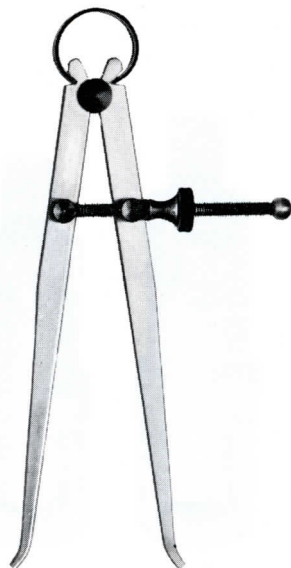
Range	No.	Blade Graduation	Angle
6"	950-271	1/32, 1/64	15° increments 180°



950-213



950-223



950-232

SPRING DIVIDERS, OUTSIDE SPRING CALIPERS, INSIDE SPRING CALIPERS

Series 950

Spring Divider: Fully hardened and tempered joints, spring, washers and divider points. High carbon steel legs deeply heat treated for lifetime service. Brushed, natural steel finish. Meets Federal Specifications Type A, Class 2.

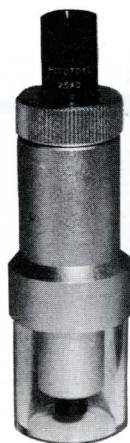
Outside Spring Caliper: Contact ends fully rounded to give accurate dimension. Brushed, natural finish.

Meets Federal Specifications Type II, Class 1.

Inside Spring Caliper: Ends fully rounded to give accurate contact with work. Brushed, natural steel finish.

Meet Federal Specifications Type 1, Class 1.

No.	Description
950-211	4" Spring Divider
950-212	6" Spring Divider
950-213	8" Spring Divider
950-221	4" Outside Spring Caliper
950-222	6" Outside Spring Caliper
950-223	8" Outside Spring Caliper
950-231	4" Inside Spring Caliper
950-232	6" Inside Spring Caliper
950-233	8" Inside Spring Caliper



183-202



183-203



183-303



183-302



183-301



183-101



183-121



183-131



183-201

POCKET MAGNIFIERS

Series 183

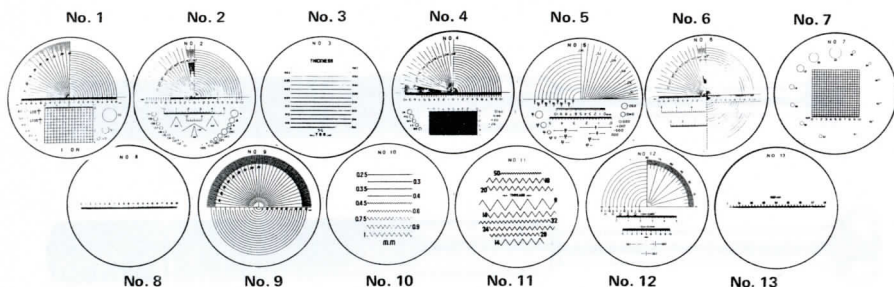
The pocket-size magnifiers shown here, ranging from 7X to 50X, are for general inspection purposes. All models are without reticles. Note the reticles such as the ones shown on the following page are not available for these models. No. 183-101, 121, 131 and 183-202, 203 are featured with a knurled ring which adjusts the focal point to personal preference.

No. 183-201, 202 and 203 provide an inverted image.

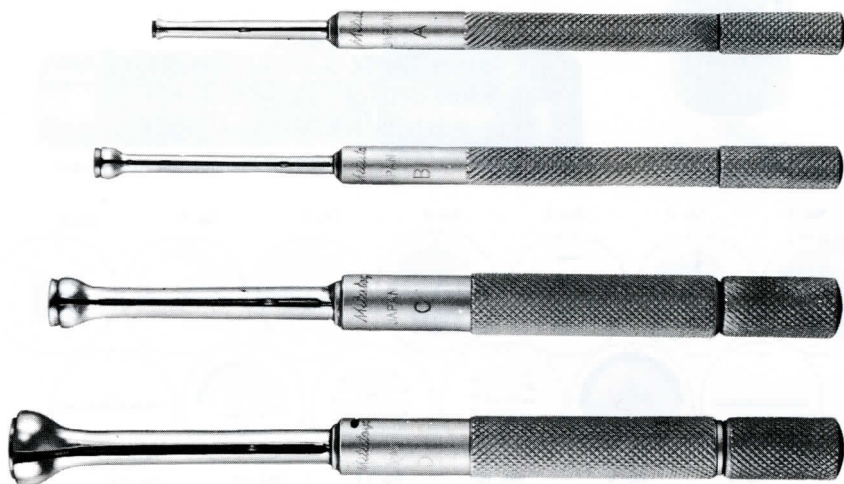
No.	Magnifications	Note
183-101	7X	
183-121	9X	
183-131	10X	
183-201	25X	Inverted image
183-202	25X	Inverted image
183-203	50X	Inverted image
183-301	7X	
183-302	10X	
183-303	15X	



950757 Illumination Attachment

**POCKET COMPARATOR** Series 183**ACCESSORIES**

No.	Description	Graduation
183-102	Reticle No. 1	Angle Grid $1^{\circ} \times 90^{\circ}$. Radius Grid .5mm x 10mm. Square Grid .005". Center Grid .1mm x 20mm. .1 to 3.0mm dia. holes.
183-103	Reticle No. 2	Angle Grid $1^{\circ} \times 10^{\circ}$, $10^{\circ} \times 90^{\circ}$. Thread Angle 55° , 29° , 118° , 60° . Hole Grid .1 to 1.0mm by .1mm, .005", .010" to .050" by .010", 1/64 to 1/16 by 1/64". Center Grid .1mm x 20mm, .005 x .500".
183-104	Reticle No. 3	Line Thickness .02 to .16mm by .01mm
183-105	Reticle No. 4	Center Grid .1mm x 20mm. Angle Grid $10^{\circ} \times 90^{\circ}$, $1^{\circ} \times 10^{\circ}$. Radius Grid .5mm x 10mm. Square Grid .01mm division, 5mm x 10mm square. Hole Grid .1mm to 1.0mm by .1mm.
183-106	Reticle No. 5	Radius Grid 1/16 to 3/8 by 1/32". Angle Grid 0° to 90° by 5° . Center Grid .0025 x .500", .2mm x 10mm, .1mm x 1.0mm. Hole Grid .002 to 1/16" in 10 units. Length Grid 1/16" to 1/4" in 7 units.
183-107	Reticle No. 6	Center Grid .1mm x 20mm, .05mm x 1.0mm. Center Grid 1/64 x 3/8". Radius Grid .5mm x 10mm, .1mm x 1.0mm 180° . Angle Grid $5^{\circ} \times 90^{\circ}$, $1^{\circ} \times 10^{\circ}$.
183-108	Reticle No. 7	Square Grid .5mm division, 10mm x 10mm square. Hole Grid .1mm to 1.0mm and 1.5, 2.0, 2.5mm 13 units.
183-109	Reticle No. 8	Center Grid .1mm x 20mm
183-110	Reticle No. 9	Radius Grid .5mm x 20mm. Angle Grid $1^{\circ} \times 180^{\circ}$
183-111	Reticle No. 10	Thread Grid .25mm to 1.0mm in 9 units.
183-112	Reticle No. 11	Thread Grid 1/50 to 1/8" in 9 units.
183-113	Reticle No. 12	Center Grid .005 x .500", .1mm x 10mm. Radius Grid 1/16 to 3/8" $0-90^{\circ}$. Angle Grid $1^{\circ} \times 90^{\circ}$
183-114	Reticle No. 13	Center Grid .005 x .800"
950757	Illumination Attachment without Battery	
183-901	Pocket Comparator 7X magnification, with reticle No. 5	
183-902	Pocket Comparator 7X magnification, with reticle No. 1, 5, 6, 11, 12, 13.	



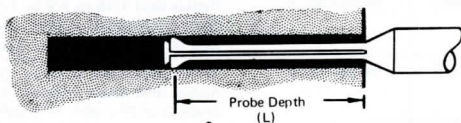
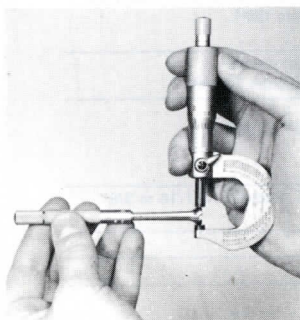
SMALL HOLE GAGES Series 154 (.125" to .500")

154-901
(Set of 4)

Extra long for gaging deep and shallow holes, slots and similar work.

- Gaging surface is a full-round with a flat bottom; permits use in smallest of shallow holes, slots and grooves, etc.
- Knurled knob at end of handle is used for size adjustment. Hole size is obtained by measuring over the contact points with a micrometer.
- Gaging surface is fully hardened to insure long tool life.
- Supplied 4 gages in a fitted case.

To check hole clearance, Small Hole Gage 154-108 is being measured by a micrometer 101-113.



Range		No.	Overall Length	Probe Depth (L)
.125"-.200"	(3-5mm)	154-105	3-5/8"	1"
.200"-.300"	(5-7.5mm)	154-106	3-7/8"	1.8"
.300"-.400"	(7.5-10mm)	154-107	4"	2.8"
.400"-.500"	(10-13mm)	154-108	4-1/4"	3"
Set of 4 gages				
.125"-.500"	(3-13mm)	154-901		

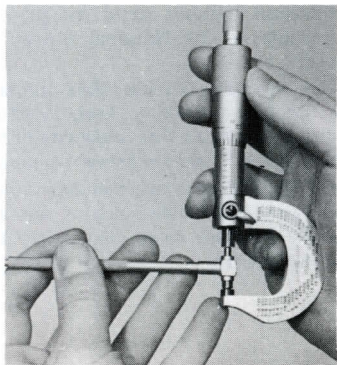


155-903
(Set of 6)

TELESCOPING GAGES Series 155

(5/16" to 6") Double Action (self-centering for quick checking of inside measurements (set of 6).

- Uniform contact pressure.
- Plunger or gage expands in hole to be measured, locked in place and gage is removed from hole. Final hole size is obtained by measuring over contacts with a micrometer.
- Constant spring tension for uniform feel.
- Rigid handle with self centering feature.
- Satin chrome finished.
- Contact Points are of hardened tool steel and precision ground on the end measuring radius.
- Six Telescoping Gages (set) are supplied in a handsome fitted carrying case.
- Available individually or in set.



Range	No.	Overall Length
5/16" - 1/2" (8 - 12.7mm)	155-121	4.200"
1/2" - 3/4" (12.7 - 19mm)	155-122	4.400"
3/4" - 1-1/4" (19 - 32mm)	155-123	4.400"
1-1/4" - 2-1/8" (32 - 54mm)	155-124	5.850"
2-1/8" - 3-1/2" (54 - 90mm)	155-125	5.850"
3-1/2" - 6" (90 - 150mm)	155-126	5.850"
5/16" - 6" (8 - 150mm)	155-903	Set of 6 Gages
1/2" - 6" (12.7 - 150mm)	155-904	Set of 5 Gages
5/16" - 2-1/8" (8 - 54mm)	155-907	Set of 4 Gages



516-904



GAGE BLOCK SET Series 516

MITUTOYO Gage Blocks are now available either in English or Metric, individually or in sets. All gage blocks are made of a special steel alloy which possess excellent stability thermal expansion coefficient for most measuring applications.

Each block is manufactured and calibrated to MITUTOYO specifications which meets or exceeds Federal Specifications GGG-G-15B. Each block is serialized regardless of the grade so that it can be easily identified when the block is re-calibrated and certified at a later date.

The quality of the surface finish on MITUTOYO blocks has been tested and compared by our users. The result indicates that MITUTOYO gage blocks have a superior surface finish.

- All MITUTOYO gage blocks meet or exceed Federal Specifications GGG-G-15B, except No. 516-904 (see page 169).
- All MITUTOYO gage block sets except set No. 516-904 are furnished with a certificate of calibration without extra charge, and are traceable to the National Bureau of Standards.
- The rugged wooden box has index numbers and is specially treated to keep moisture away from the blocks. The underside of the case has four soft pads to prevent slippage.
- All gage block edges have blended radius, and are burr-proofed. Wringing or stacking the block does not cause damage to the measuring surfaces.



GAGE BLOCKS

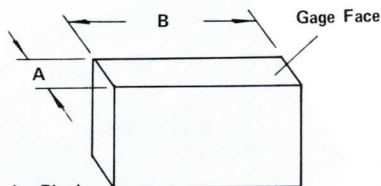
CERTIFICATE AND SERIAL NUMBER

It is an absolute necessity that each gage block carries its own Serial Number for calibration purposes, and also, to determine the actual size closest to the millionth. Please note all MITUTOYO Blocks are serialized regardless of the grade classification.

A Certificate of Accuracy, traceable to the National Bureau of Standards, furnished with each MITUTOYO gage block set and individual block. It indicates the actual size of each block to the closest millionth. This Certificate, a highly important part of gage block use, is automatically provided with sets or individual blocks without additional cost.

BLOCK DIMENSIONS

MITUTOYO has two block sizes as described below.



Rectangular Block

Nominal Size	Face Width (A)	Face Length (B)
up to .400"	.355"	1.181"
.450" & up	.355"	1.378"
up to 5.5mm	9mm	30mm
6mm & up	9mm	35mm

Federal Specification GGG-G-15B Tolerances on length for English Gage Blocks			
Tolerance grade			
Nominal size	1 (formerly grade AA)	2 (formerly grade A+)	3 (compromise between former grades A and B)
Inches	Tolerances in microinches		
1" and less	+2 -2	+4 -2	+8 -4
2"	+4 -4	+8 -4	+16 -8
3"	+5 -5	+10 -5	+20 -10
4"	+6 -6	+12 -6	+24 -12

Federal Specification GGG-G-15B Tolerances on length for Metric Gage Blocks			
Tolerance grade			
Nominal size	1 (formerly grade AA)	2 (formerly grade A+)	3 (compromise between former grades A and B)
mm	Tolerances in microns (.001mm)		
10 or less	+0.05 -0.05	+0.10 -0.05	+0.20 -0.10
over 10 thru 25	+0.08 -0.08	+0.15 -0.08	+0.30 -0.15
over 25 thru 50	+0.10 -0.10	+0.20 -0.10	+0.40 -0.20
over 50 thru 75	+0.13 -0.13	+0.25 -0.12	+0.45 -0.22
over 75 thru 100	+0.15 -0.15	+0.30 -0.15	+0.60 -0.30



516-902
81 pcs. GRADE 2 SET



516-915
35 pcs. GRADE 3 SET

INCH GAGE BLOCK SETS

Number of Blocks	Block Combination in Set	Grade	No.
81 pcs Set	9 Blocks .1001 - .1009 in .0001" steps	1 (AA)	516-901
	49 Blocks .101 - .149 in .001" steps	2 (A+)	516-902
	19 Blocks .050 - .950 in .050" steps	3 (A & B)	516-903
	4 Blocks 1.000 - 4.000 in 1.000" steps	B*	516-904
35 pcs Set	2 Blocks .1000 and .10005"	2 (A+)	516-914
	9 Blocks .1001 - .1009 in .0001" steps		
	9 Blocks .101 - .109 in .001" steps		
	9 Blocks .110 - .190 in .01" steps	3 (A & B)	516-915
	3 Blocks .200, .300 and .500"		
9 pcs Set with optical flat	3 Blocks 1.000, 2.000 and 4.000"		
	2 Blocks .0625 and .1000"	2 (A+)	516-930
	1 Block .125"	3 (A & B)	516-931
9 pcs Set No optical flat	3 Blocks .200, .250 and .300"	3 (A & B)	516-935
	3 Blocks .500, 1.000 and 2.000"		

*The B grade 516-904 is furnished with a certificate of accuracy stating $+0.000010''$ and $-0.000006''$ for all blocks one inch and under, and $+0.000010''$ and $-0.000006''$ for each additional inch.



METRIC GAGE BLOCK SETS

1mm BASE METRIC GAGE BLOCK SETS

Number of Blocks	Block Combination in Set	Grade	No.
112 pcs Set	1 Block 1.0005mm	1 (AA)	516-938
	1 Block 0.5mm		
	9 Blocks 1.001—1.009 in .001mm steps	2 (A+)	516-939
	49 Blocks 1.01—1.49 in .01mm steps		
	48 Blocks 1—24.5 in 0.5mm steps	3 (A & B)	516-940
	4 Blocks 25—100 in 25mm steps		
103 pcs Set	1 Block 1.005mm	1 (AA)	516-941
	49 Blocks 1.01—1.49 in .01mm steps	2 (A+)	516-942
	49 Blocks 0.5—24.5 in .5mm steps	3 (A & B)	516-943
	4 Blocks 25—100 in 25mm steps		
87 pcs Set	9 Blocks 1.001—1.009 in .001mm steps	2 (A+)	516-946
	49 Blocks 1.01—1.49 in .01mm steps		
	19 Blocks 0.5—9.5 in 0.5mm steps	3 (A & B)	516-947
	10 Blocks 10—100 in 10mm steps		
56 pcs Set	1 Block 1.005mm	2 (A+)	516-954
	9 Blocks 1.001—1.009 in .001mm steps		
	9 Blocks 1.01—1.09 in .01mm steps		
	9 Blocks 1.1—1.9 in 0.1mm steps		
	24 Blocks 1—24 in 1mm steps	3 (A & B)	516-955
	4 Blocks 25—100 in 25mm steps		
47 pcs Set	1 Block 0.5mm	2 (A+)	516-958
	9 Blocks 1.01—1.09 in .01mm steps		
	9 Blocks 1.1—1.9 in 0.1mm steps		
	24 Blocks 1—24 in 1mm steps		
	4 Blocks 25—100 in 25mm steps	3 (A & B)	516-959

METRIC GAGE BLOCK SETS

2mm BASE METRIC GAGE BLOCK SETS

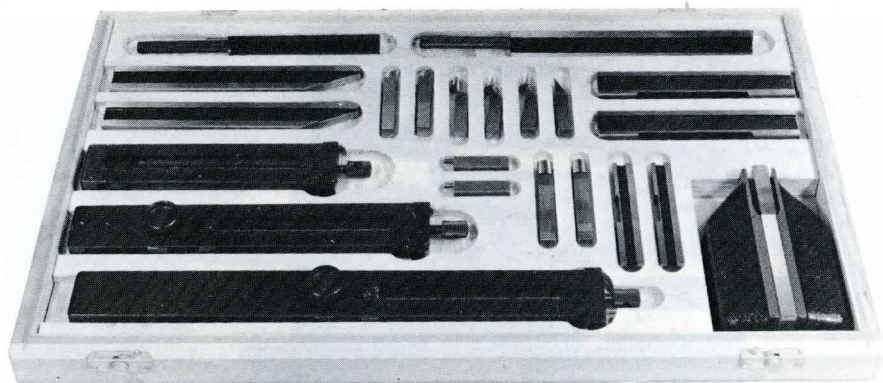
Number of Blocks	Block Combination in Set	Grade	No.
112 pcs Set	1 Block 2.0005mm 9 Blocks 2.001–2.009 in .001mm steps 49 Blocks 2.01–2.49 in .01mm steps 49 Blocks 0.5–24.5 in 0.5mm steps 4 Blocks 25–100 in 25mm steps	1 (AA) 2 (A+) 3 (A & B)	516-514 516-515 516-516
88 pcs Set	1 Block 2.0005mm 9 Blocks 2.001–2.009 in .001mm steps 49 Blocks 2.01–2.49 in .01mm steps 19 Blocks 0.5–9.5 in 0.5mm steps 10 Blocks 10–100 in 10mm steps	2 (A+) 3 (A & B)	516-519 516-520
47 pcs Set	1 Block 2.0005mm 9 Blocks 2.001–2.009 in .001mm steps 9 Blocks 2.01–2.09 in .01mm steps 9 Blocks 2.1–2.9 in 0.1mm steps 9 Blocks 1–9 in 1mm steps 10 Blocks 10–100 in 10mm steps	2 (A+) 3 (A & B)	516-523 516-524

LONG BLOCK INCH GAGE BLOCK SET

Number of Blocks	Block Combination in Set	Grade	No.
8 pcs Set	1", 2", 3", 4", 5", 6", 7", 8"	2 (A+)	516-126

LONG BLOCK METRIC GAGE BLOCK SET

Number of Blocks	Block Combination in Set	Grade	No.
8	125, 150, 175, 200, 250, 300, 400, 500mm	2 (A+)	516-702



516-601

GAGE BLOCK ACCESSORIES

Series 516

METRIC	516-601 22 Pc. Set	516-602 14 Pc. Set
Description		
Holder 60mm		X
Holder 100mm	X	X
Holder 160mm	X	X
Holder 250mm	X	X
Base Block 35mm	X	X
Round Jaw 2mm (Pair)	X	X
Round Jaw 5mm (Pair)	X	X
Round Jaw 8mm (Pair)	X	X
Round Jaw 12.5mm (Pair)	X	
Round Jaw 20mm (Pair)	X	
Flat Jaw (Pair)	X	
Scriber	X	X
Center Point	X	X
Tram Point (Pair)	X	
Triangle Straight Edge, 100mm	X	X
Triangle Straight Edge, 160mm	X	

INCH		
Individual Accessory	516-604 22-pc. set	516-603 14-pc. set
Holder, 2.4" clamping capacity		X
Holder, 4" clamping capacity	X	X
Holder, 6" clamping capacity	X	X
Holder, 10" clamping capacity	X	X
Base Block, 1.375" Base Height	X	X
Round Jaw, .100" radius (pair)	X	X
Round Jaw, .200" radius (pair)	X	X
Round Jaw, .250" radius (pair)	X	X
Round Jaw, .500" radius (pair)	X	
Round Jaw, .750" radius (pair)	X	
Flat Jaw (pair)	X	
Scriber	X	X
Center Point	X	X
Tram Point (pair)	X	
Triangle Straight Edge, 4" Length	X	X
Triangle Straight Edge, 6" Length	X	

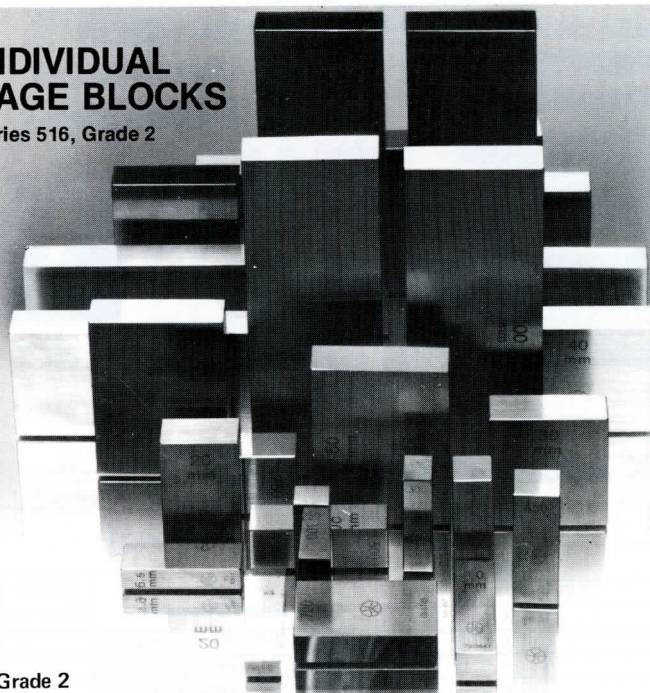
**CARBIDE WEAR
BLOCKS**

No.	Number of Blocks	Grade	Dimension
516-807	Pair	2 (A+)	1mm
516-803	Pair	2 (A+)	2mm
516-805	Pair	2 (A+)	.100"
516-804	Pair	3 (A & B)	.100"
516-809	Pair	2 (A+)	.050"
516-808	Pair	3 (A & B)	.050"

Wear blocks are serialized and supplied with certificate of accuracy and wooden case.

INDIVIDUAL GAGE BLOCKS

Series 516, Grade 2



INCH, Grade 2

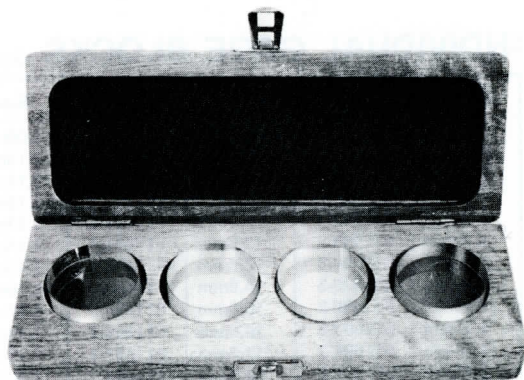
Size	No.	Size	No.	Size	No.	Size	No.
.050"	611105-2	.108"	611148-2	.131"	611171-2	.500"	611195-2
.150"	611115-2	.109"	611149-2	.132"	611172-2	.600"	611196-2
.160"	611116-2	.110"	611150-2	.133"	611173-2	.700"	611197-2
.170"	611117-2	.111"	611151-2	.134"	611174-2	.800"	611198-2
.180"	611118-2	.112"	611152-2	.135"	611175-2	.900"	611199-2
.190"	611119-2	.113"	611153-2	.136"	611176-2	1.000"	611201-2
.1001"	611121-2	.114"	611154-2	.137"	611177-2	2.000"	611202-2
.1002"	611122-2	.115"	611155-2	.138"	611178-2	3.000"	611203-2
.1003"	611123-2	.116"	611156-2	.139"	611179-2	4.000"	611204-2
.1004"	611124-2	.117"	611157-2	.140"	611180-2	5.000"	611205-2
.1005"	611125-2	.118"	611158-2	.141"	611181-2	6.000"	611206-2
.1006"	611126-2	.119"	611159-2	.142"	611182-2	7.000"	611207-2
.1007"	611127-2	.120"	611160-2	.143"	611183-2	8.000"	611208-2
.1008"	611128-2	.121"	611161-2	.144"	611184-2	.250"	611212-2
.1009"	611129-2	.122"	611162-2	.145"	611185-2	.350"	611213-2
.10005"	611135-2	.123"	611163-2	.146"	611186-2	.450"	611214-2
.101"	611141-2	.124"	611164-2	.147"	611187-2	.550"	611215-2
.102"	611142-2	.125"	611165-2	.148"	611188-2	.650"	611216-2
.103"	611143-2	.126"	611166-2	.149"	611189-2	.750"	611217-2
.104"	611144-2	.127"	611167-2	.100"	611191-2	.850"	611218-2
.105"	611145-2	.128"	611168-2	.200"	611192-2	.950"	611219-2
.106"	611146-2	.129"	611169-2	.300"	611193-2	.210"	611221-2
.107"	611147-2	.130"	611170-2	.400"	611194-2	.0625"	611303-2



METRIC

INDIVIDUAL GAGE BLOCKS Series 516, Grade 2

Size	No.	Size	No.	Size	No.	Size	No.
0.5mm	611506-3	1.28mm	611588-3	7.5mm	611647-3	2.09mm	611709-3
1.6mm	611516-3	1.29mm	611589-3	8.5mm	611648-3	2.10mm	611710-3
1.7mm	611517-3	1.30mm	611590-3	9.5mm	611649-3	2.11mm	611711-3
1.8mm	611518-3	1.31mm	611591-3	10.5mm	611650-3	2.12mm	611712-3
1.9mm	611519-3	1.32mm	611592-3	11.5mm	611651-3	2.13mm	611713-3
1.0005mm	611520-3	1.33mm	611593-3	12.5mm	611652-3	2.14mm	611714-3
1.001mm	611521-3	1.34mm	611594-3	13.5mm	611653-3	2.15mm	611715-3
1.002mm	611522-3	1.35mm	611595-3	14.5mm	611654-3	2.16mm	611716-3
1.003mm	611523-3	1.36mm	611596-3	15.5mm	611655-3	2.17mm	611717-3
1.004mm	611524-3	1.37mm	611597-3	16.5mm	611656-3	2.18mm	611718-3
1.005mm	611525-3	1.38mm	611598-3	17.5mm	611657-3	2.19mm	611719-3
1.006mm	611526-3	1.39mm	611599-3	18.5mm	611658-3	2.20mm	611720-3
1.007mm	611527-3	1.40mm	611600-3	19.5mm	611659-3	2.21mm	611721-3
1.008mm	611528-3	1.41mm	611601-3	20.5mm	611660-3	2.22mm	611722-3
1.009mm	611529-3	1.42mm	611602-3	21.5mm	611661-3	2.23mm	611723-3
0.991mm	611551-3	1.43mm	611603-3	22.5mm	611662-3	2.24mm	611724-3
0.992mm	611552-3	1.44mm	611604-3	23.5mm	611663-3	2.25mm	611725-3
0.993mm	611553-3	1.45mm	611605-3	24.5mm	611664-3	2.26mm	611726-3
0.994mm	611554-3	1.46mm	611606-3	10.0mm	611671-3	2.27mm	611727-3
0.995mm	611555-3	1.47mm	611607-3	20.0mm	611672-3	2.28mm	611728-3
0.996mm	611556-3	1.48mm	611608-3	30.0mm	611673-3	2.29mm	611729-3
0.997mm	611557-3	1.49mm	611609-3	40.0mm	611674-3	2.30mm	611730-3
0.998mm	611558-3	1.0mm	611611-3	50.0mm	611675-3	2.31mm	611731-3
0.999mm	611559-3	2.0mm	611612-3	60.0mm	611676-3	2.32mm	611732-3
1.01mm	611561-3	3.0mm	611613-3	70.0mm	611677-3	2.33mm	611733-3
1.02mm	611562-3	4.0mm	611614-3	80.0mm	611678-3	2.34mm	611734-3
1.03mm	611563-3	5.0mm	611615-3	90.0mm	611679-3	2.35mm	611735-3
1.04mm	611564-3	6.0mm	611616-3	100.0mm	611681-3	2.36mm	611736-3
1.05mm	611565-3	7.0mm	611617-3	200.0mm	611682-3	2.37mm	611737-3
1.06mm	611566-3	8.0mm	611618-3	300.0mm	611683-3	2.38mm	611738-3
1.07mm	611567-3	9.0mm	611619-3	400.0mm	611684-3	2.39mm	611739-3
1.12mm	611568-3	11.0mm	611621-3	500.0mm	611685-3	2.40mm	611740-3
1.09mm	611569-3	12.0mm	611622-3			2.41mm	611741-3
1.10mm	611570-3	13.0mm	611623-3	2.0005mm	611690-3	2.42mm	611742-3
1.11mm	611571-3	14.0mm	611624-3	2.001mm	611691-3	2.43mm	611743-3
1.12mm	611572-3	15.0mm	611625-3	2.002mm	611692-3	2.44mm	611744-3
1.13mm	611573-3	16.0mm	611626-3	2.003mm	611693-3	2.45mm	611745-3
1.14mm	611574-3	17.0mm	611627-3	2.004mm	611694-3	2.46mm	611746-3
1.15mm	611575-3	18.0mm	611628-3	2.005mm	611695-3	2.47mm	611747-3
1.16mm	611576-3	19.0mm	611629-3	2.006mm	611696-3	2.48mm	611748-3
1.17mm	611577-3	21.0mm	611631-3	2.007mm	611697-3	2.49mm	611749-3
1.18mm	611578-3	22.0mm	611632-3	2.008mm	611698-3	2.6mm	611750-3
1.19mm	611579-3	23.0mm	611633-3	2.009mm	611699-3	2.7mm	611751-3
1.20mm	611580-3	24.0mm	611634-3	2.01mm	611701-3	2.8mm	611752-3
1.21mm	611581-3	25.0mm	611635-3	2.02mm	611702-3	2.9mm	611753-3
1.22mm	611582-3	1.5mm	611641-3	2.03mm	611703-3		
1.23mm	611583-3	2.5mm	611642-3	2.04mm	611704-3	75.0mm	611801-3
1.24mm	611584-3	3.5mm	611643-3	2.05mm	611705-3	125.0mm	611802-3
1.25mm	611585-3	4.5mm	611644-3	2.06mm	611706-3	150.0mm	611803-3
1.26mm	611586-3	5.5mm	611645-3	2.07mm	611707-3	175.0mm	611804-3
1.27mm	611587-3	6.5mm	611646-3	2.08mm	611708-3	250.0mm	611805-3



157-901

OPTICAL PARALLELS

Series 157

Mitutoyo Optical Parallels are designed to inspect parallelism and flatness of the micrometers measuring faces.

The No. 157-901 shown above is frequently used for the 1" English Micrometers, and consists of 4 thickness;

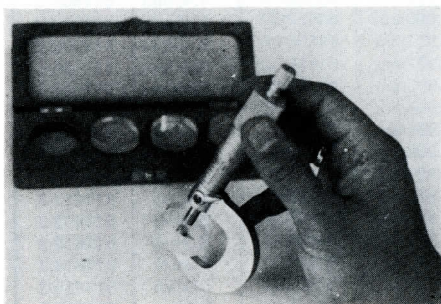
.5002" .5060", .5127", .5183"

The .5002" thick optical parallel detects parallelism between the anvil and spindle at the 12 o'clock position.

.5060" thick optical parallel indicates parallelism of two measuring faces at 9 o'clock position, or 90 degree turned spindle position in relation to the stationary anvil face.

.5127" and .5183" thick parallels check the relationship between the measuring faces at 180 degree and 270 degree turned position respectively.

Each of one of the 4 optical parallels is capable of detecting not only flatness of the micrometers measuring ends, but also the flatness or surface irregularities of highly lapped work surfaces.



To check flatness or parallelism, avoid grit, glare or vibration. Also remove burrs, dirt, or oil from the specimen.

It is a rarity to find a new Mitutoyo Micrometer with 4 bands parallelism. Most MITUTOYO Micrometers have a maximum of 3 bands or less.

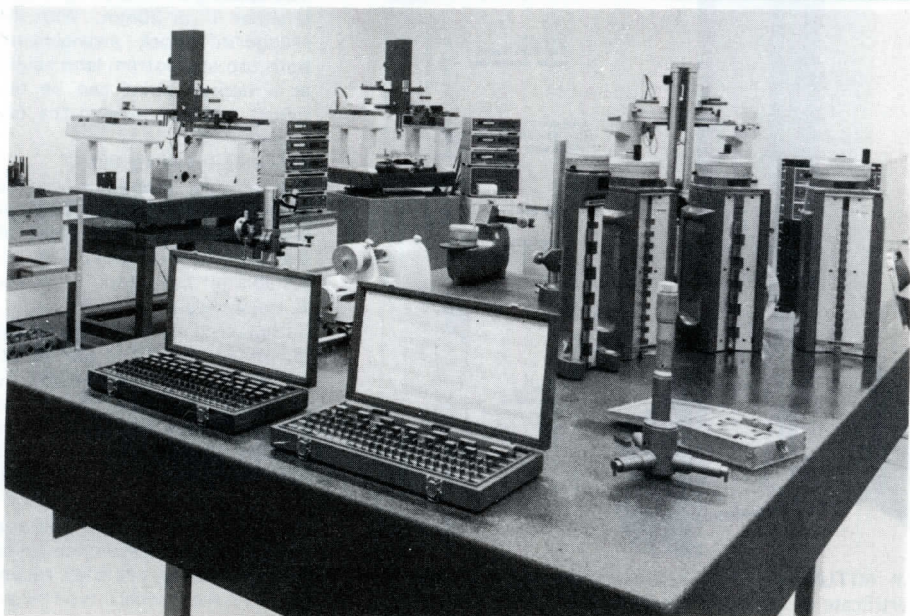
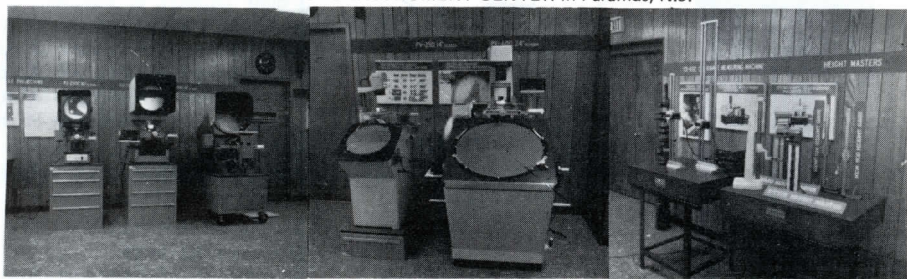
- Diameter of optical parallel 1.190".
- Each parallel is engraved with a thickness measurement.
- Supplied with fitted carrying case.
- Only optical parallels let the inspector see one of the most critical points of the micrometer - flatness and parallelism.

No.	Size			
157-901	.500"	.506"	.512"	.518"

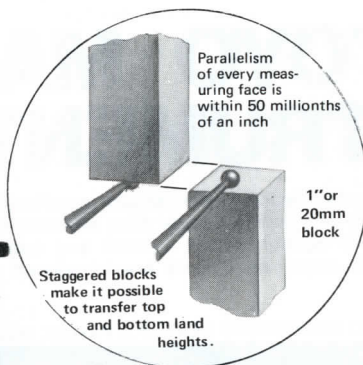
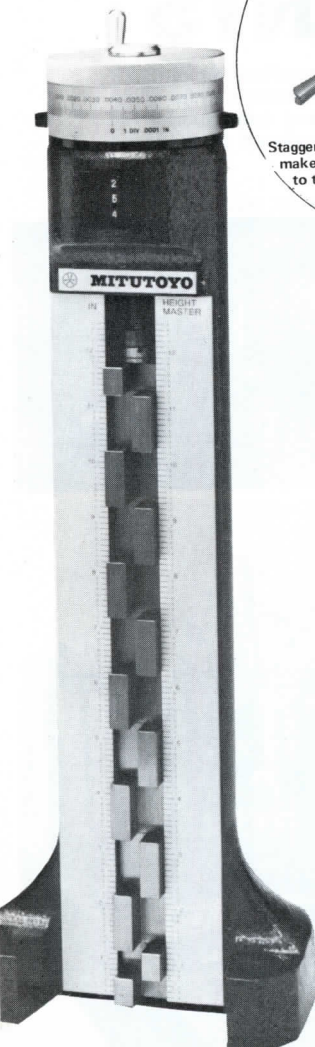
MITUTOYO MAJOR INSTRUMENTS

MITUTOYO, the world's leading and largest manufacturer of precision measuring instruments, makes more sophisticated instruments needed in quality control centers and calibration departments. These major instruments are introduced in the following pages.

MITUTOYO INSTRUMENT CENTER in Paramus, N.J.

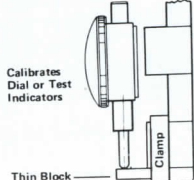


MITUTOYO INSTRUMENT CENTER in Los Angeles



APPLICATION EXAMPLES WITH ACCESSORIES

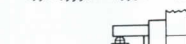
Measuring Blocks



Calibrates Dial Bore Gages' probe movements

Two-point contact Dial Bore Gage with roller guide

Base Block



Calibrates Rod-type or Extension-type inside micrometers

E-TYPE HEIGHT MASTER Series 515

The new E-type Height Master is a slimmer version of the standard height master.

Despite its lean appearance, it features all essential specifications required in a versatile height standard.

1. Digital counter .001"

3-digit counter is featured for quick and trouble-free reading to thousandths. The counter works and reads exactly like a standard height master. From top, tenth, hundredth and thousandth of an inch.

3 digits indicated on the metric model are in millimeters.

2. Staggered measuring block configuration

The spacing of measuring blocks is either 1" or 20mm. With the staggered block arrangement, both top and bottom land height at a desired point can be obtained without moving the micrometer head.

3. Smallest reading .0001"

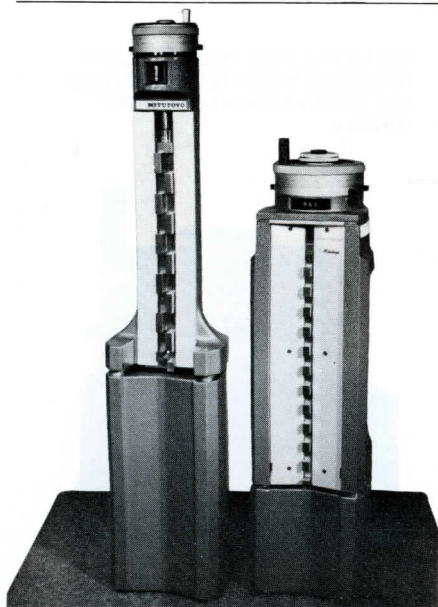
The smallest graduation on the micrometer thimble is .0001" or 0.002mm direct. Zero point of the thimble is designed fully adjustable for calibration purposes.

4. Height capacity to 36"

Although the measurable height is limited to 12", it can be extended to maximum of 36" by using a riser block. The E-type Height Master stands on three carbide tipped pads, which in turn rest on the carbide pads atop the riser block.

All features considered, the new E-type Height Master has equal gaging capacity, yet is less expensive than the standard type height master.

All MITUTOYO Height Masters are supplied with a certificate of accuracy traceable to the National Bureau of Standards.



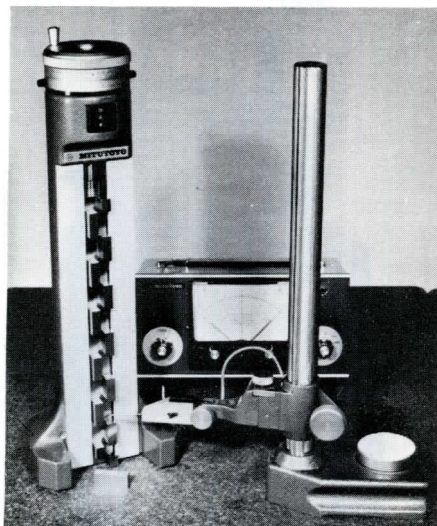
RISER BLOCK Series 515

The measuring range of the two most popular Height Masters, 12" and 300mm models, can be easily extended by Riser Blocks. It is, now, possible to precisely measure to heights of 18", 24" and 36" with the 12" model, and, to heights of 450mm and 600mm with the 300mm model.

Riser Blocks are specially designed and precisely made to maintain the stipulated basic accuracy of both Standard and E-Type Height Masters. They are available in two accuracy grades, and, in 6", 12" and 24" heights and in 150mm and 300mm heights for the inch and metric models, respectively.

The seasoned cast-iron Riser Blocks sit on three carbide-faced and lapped pads which assure perpendicularity to the surface plate. The Height Masters, in turn, fit onto three carbide-faced seating pads on the Riser Blocks, and, are accurately positioned by two locating pins.

Certificates of Accuracy are furnished for Riser Blocks, in each accuracy grade, to verify that their accuracy is traceable to the National Bureau of Standards.



E-type Height Master (515-319), Mu-Checker (519-142), Lever Head for Mu-Checker (515-106) and Transfer Stand (519-109) shown above, are the set often used in QC rooms.

RISER BLOCK

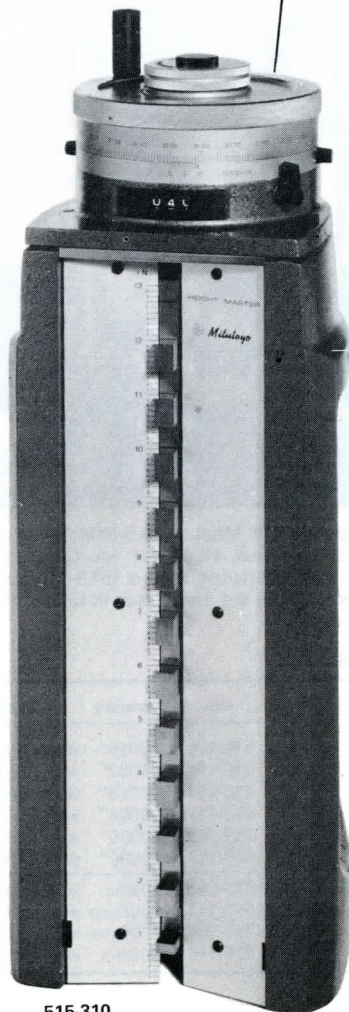
	Size	No.	Accuracy	Remarks
Inch	6"	515-106	$\pm 0.0010''$	with Certificate
	6"	515-116	$\pm 0.0002''$	with Certificate
	12"	515-107	$\pm 0.0015''$	with Certificate
	12"	515-117	$\pm 0.0004''$	with Certificate
	24"	515-108	$\pm 0.0030''$	with Certificate
	24"	515-118	$\pm 0.0008''$	with Certificate
Metric	150mm	515-103	$\pm 0.002\text{mm}$	with Certificate
	150mm	515-113	$\pm 0.0006\text{mm}$	with Certificate
	300mm	515-104	$\pm 0.0025\text{mm}$	with Certificate
	300mm	515-114	$\pm 0.001\text{mm}$	with Certificate

E — TYPE HEIGHT MASTER

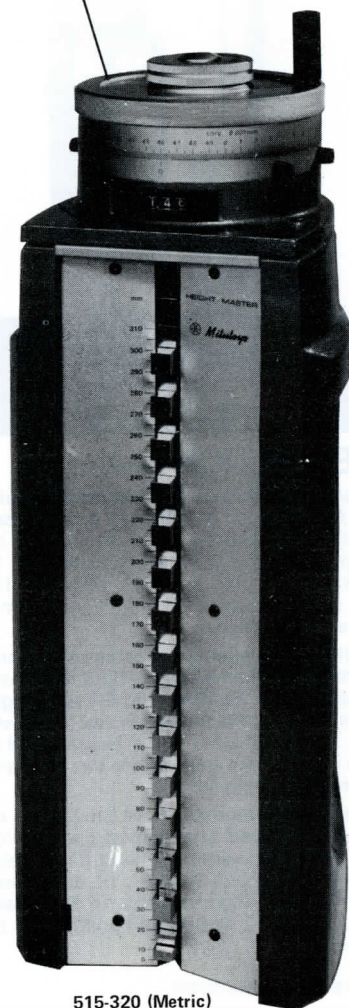
	Range	No.	Graduation	Block Formation	Remarks
Inch	12"	515-319	.0001"	Staggered 1,000	with Certificate and .600" setting block with Certificate and 11mm setting block
Metric	300mm	515-318	0.002mm	Staggered 20mm	

THE THIMBLE READS DIRECTLY TO .0001". THIS IS FURTHER SUBDIVIDED BY A FLUSH FITTED VERNIER SCALE TO INDICATE .00001".

THE METRIC UNIT READS DIRECTLY TO 0.001mm, WHICH IS THE SMALLEST AND FINAL GRADUATION ON THE THIMBLE.



515-310



515-320 (Metric)

Standard Straight Measuring Block Configuration
 .500" Blocks for INCH. 10mm for METRIC models.



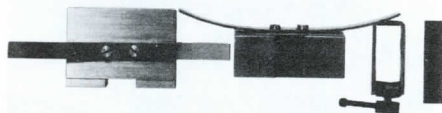
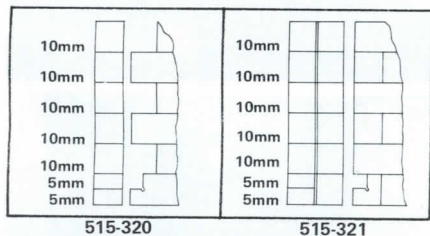
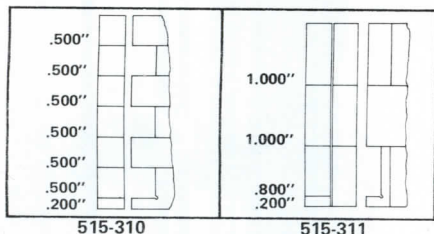
HEIGHT MASTER Series 515

MITUTOYO Height Master is available from 12" (300mm) to 40" in various types for required measuring applications.

The most commonly used Height Master, 12" and 300mm models as shown on the opposing page, have two block configurations; one is straight .500" or 10mm block, the other is staggered 1.000" or 10mm block (see illustration).

The staggered block configuration is available only in 12" and 300mm models.

All Height Masters, except those with digital displays, are featured with a mechanical digital counter reading to .001" for English models, or to .01mm in the case of Metric versions.

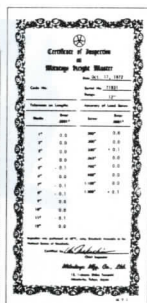


Accessory (515-119)

A pair of special blocks, clamp and a thin block make it possible to calibrate dial bore gages, dial indicators, test indicators, inside rod type micrometer, etc.

Fits 515-310 Straight Block Only

COMPARTMENT
FOR ACCESSORIES.
12" & 300mm
MODELS ONLY



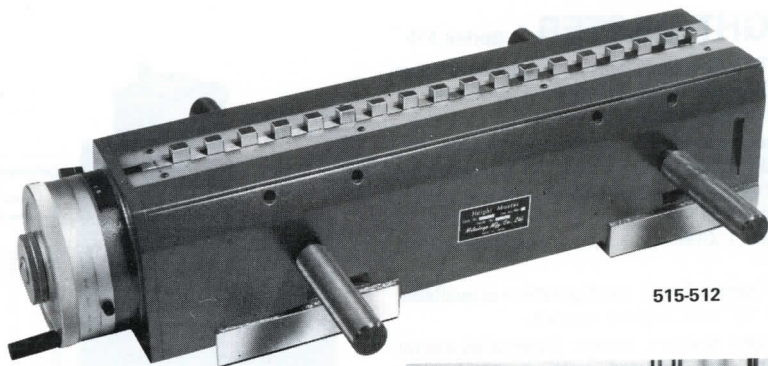
TRACEABLE
CERTIFICATE

Each height master is supplied with a certificate of accuracy traceable to the National Bureau of Standards. It certifies the measuring block accuracy (from surface plate to the top land of each measuring block) and lead screw accuracy to 10 millionths of an inch. A .300" individual gage block is also supplied with each height master for zero setting and calibrating the bottom measuring block, which is .200" in thickness.

MITUTOYO height master's smallest reading is 10 millionths. Digital counter provides thousandths reading, thimble reads directly in tenths, and finally to 10 millionths by adjustable vernier scale. Rugged, fitted wooden case is furnished with each height master listed on this page.

Range	No.	Graduation	Note
Inch			
0-12"	515-310	.00001"	Staggered*
0-12"	515-311	.00001"	
Metric			
0-300mm	515-320	0.001mm	Staggered*
0-300mm	515-321	0.001mm	
Accessories	515-119		Block Set

* With Staggered Block Configuration

**515-512**

HEIGHT MASTER Series 515

18", 24" and 40" Models.

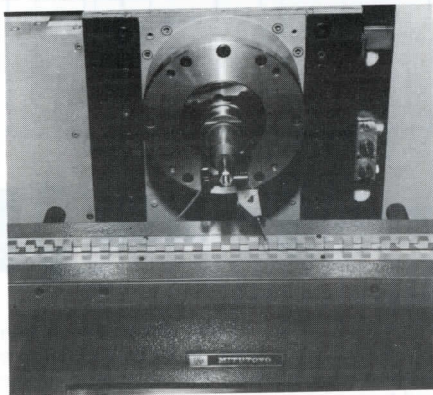
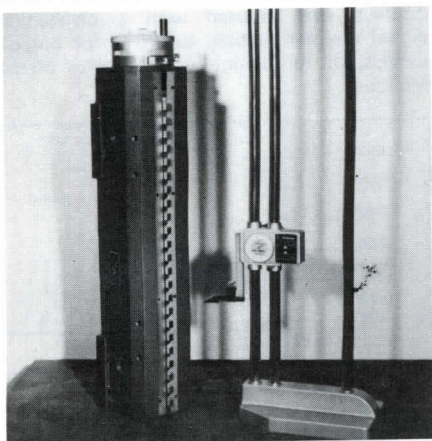
Vertical or Horizontal application with Digital Counter.

The larger 18", 24" and 40" Height Masters are designed for both vertical and horizontal measuring applications.

Although they are primarily height standard gages and generally used on the surface plate, horizontal dimensions are also easily obtained by any one of these Height Masters.

The measuring column consists of .500" stacked and permanently wrung gage blocks, and rides on crossed roller bearings which allow a true linear traverse.

The mechanical Digital Counter provides quick reading to thousandths.



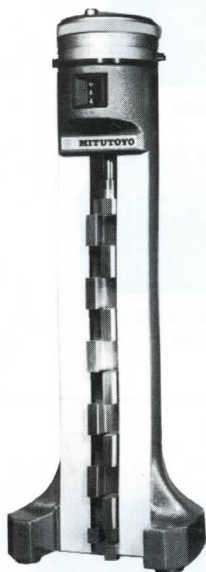
Range	No.	Graduation
0-18"	515-512	.00001"
0-24"	515-510	.00001"
0-40"	515-513	.00001"

For more information, request Height Master Bulletin. Base support and remote hand wheel also available.

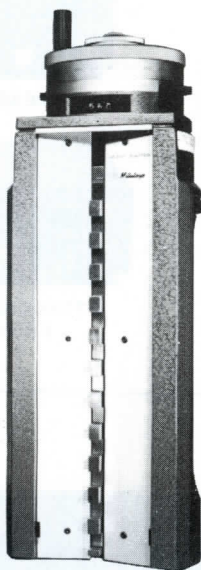
Table position is inspected by Height-Master and Lever Head connected to Mu-Checker 519 Series.



515-319
E-Type Height
Master



515-310
Standard
Height Master



For setting MITUTOYO Dial Bore Gages
INCH

Accessory No.	515-119	515-120	515-121
.700-1.400" *	900439	900889	900439
1.400-6" *	900440	900890	900440
Clamp Box	900385	900882	900882
Ref. Block	102394	102394	102394
For Height Master	515-310	515-319	515-311

METRIC

Accessory No.	515-110	515-111
18-35mm *	900437	900887
35-150mm *	900438	900888
Clamp Box	900386	900881
Ref. Block	102355	102355
For Height Master	515-320 515-321	515-318

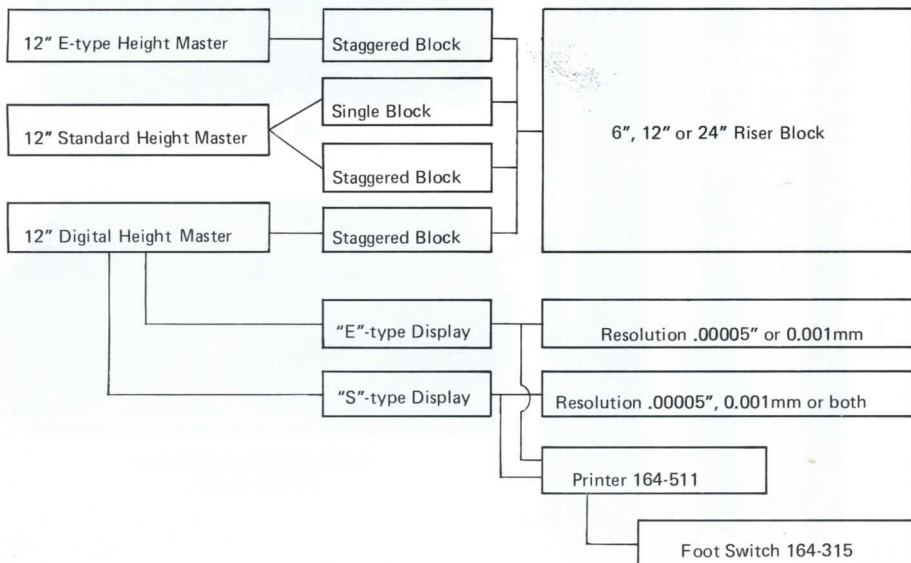
* Dial Bore Gage measuring range

12" HEIGHT MASTER SELECTION GUIDE

Models

Block Configuration

Riser Blocks

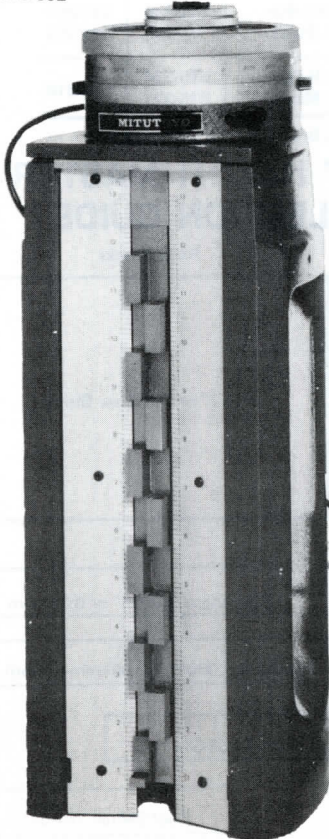


HEIGHT MASTER Series 515

With Digital Display Unit

All Height Masters listed herein consist of an S or E-type digital display unit and a specially designed Height Master main unit with pulse generating disc encoder. The Height Master is featured with 1" (20mm for Metric models) staggered measuring blocks. Additional riser blocks can also be used on this unit to increase its range to a maximum 36". The standard resolution is 50 millionths of an inch or 1 micron for Metric models.

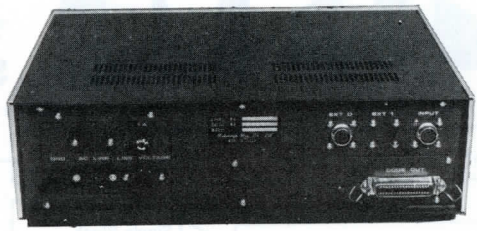
515-302



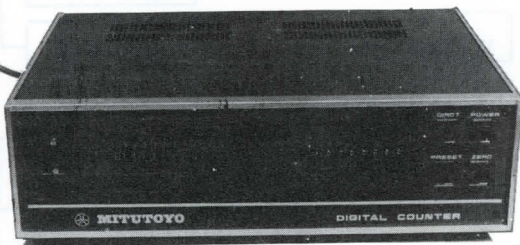
REAR PANEL 164-751



E-TYPE DIGITAL DISPLAY FRONT PANEL



REAR PANEL 164-641



S-TYPE DIGITAL DISPLAY FRONT PANEL

**SELECTION GUIDE**

- Selection 1: Inch only
(either "E" or "S"-type Display can be selected)
- Selection 2: Metric only
(either "E" or "S"-type Display can be selected)
- Selection 3: A. Inch/Metric dual reading
(with "S"-type Display only)
B. Metric/Inch dual reading
(with "S"-type Display only)

Note, Inch/Metric models consist of an inch Height Master and "S"-type Display which counts inch pulses and converts them into the metric

equivalents. Because of this, the last digit of the converted metric value will not be a continuous 0-9 display, but it will register the nearest metric equivalent.

On the other hand, the Metric/Inch models consist of a metric Height Master and "S"-type Display which counts metric pulses and converts them into the inch equivalents.

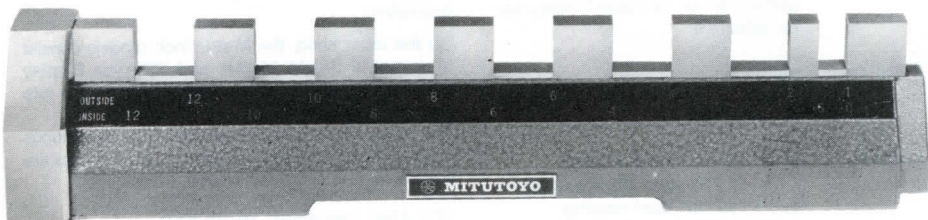
The Metric/Inch models register 0-9 continuous display on the last digit, while inch equivalents are shown in a 0-5-0-5 sequence.

"E" AND "S"-TYPE DISPLAYS

The specifications for "E" and "S"-type Displays are described under "Digi-Matic" Series 164. For additional specifications, see "Digi-Matic" series in this catalog.

	Range	No.	Combination of		Resolution
			Ht. Master	Display & Type	
Inch	0-12"	515-913 515-914	515-302 515-302	164-751 "E" 164-641 "S"	± 00.00005" ± 00.00005"
Metric	0-300mm	515-907 515-908	515-301 515-301	164-720 "E" 164-620 "S"	± 0000.001mm ± 0000.001mm
Inch/Metric	0-12" 0-300mm	515-915	515-302	164-646 "S"	± 00.00005" ± 0000.001mm*
Metric/Inch	0-300mm 0-12"	515-911	515-301	164-630 "S"	± 0000.001mm ± 00.00005"
Inch	0-18"	515-916 515-917	515-304 515-304	164-751 "E" 164-641 "S"	± 00.00005" ± 00.00005"
Inch/Metric	0-18" 0-450mm	515-918	515-304	164-646 "S"	± 00.00005" ± 0000.001mm *
Inch	0-24" 0-24"	515-919 515-920	515-306 515-306	164-751 "E" 164-641 "S"	± 00.00005" ± 00.00005"
Metric	0-600mm 0-600mm	515-909 515-910	515-305 515-305	164-720 "E" 164-620 "S"	± 0000.001mm ± 0000.001mm
Inch/Metric	0-24" 0-600mm	515-921	515-306	164-646 "S"	± 00.00005" ± 0000.001mm *
Metric/Inch	0-600mm 0-24"	515-912	515-305	164-630 "S"	± 0000.001mm ± 00.00005"

* - Last digit will not register continuous 0 - 9. Closest metric equivalent will be indicated on display.



515-560

"CALIPER CHECKER"

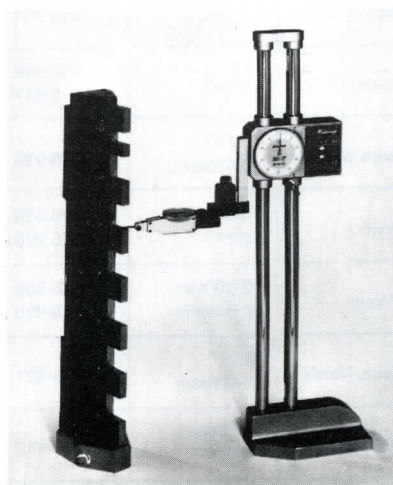
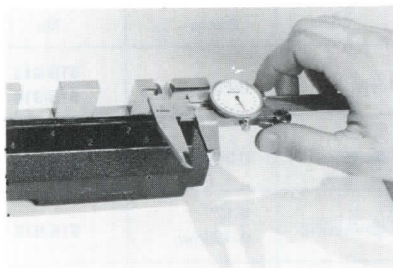
Series 515

The Caliper Checker is specially designed to calibrate Calipers and Height Gages of various types. It is comprised of 16 high grade Gage Blocks permanently wrung and covered by a protective casting.

The Caliper Checker provides spacings of .500", 1", 2", 4", 6", 8", 10", 12" for both inside and outside Jaw calibration. These check points conform with inspecting points stipulated in Federal Specifications.

The Caliper Checker also stands perpendicular to the surface plate for Height Gage inspection. The maximum height measurable is 15". A Certificate of Accuracy is furnished.

- Outside Jaw check points:
.500", 1", 2", 4", 6", 8", 10", 12".
- Inside Jaw check points:
.500", 1", 2", 4", 6", 8", 10", 12".
- Height checking points:
2", 4", 6", 10", 12", 13.5", 15".
- Additional thin block .105" is included.



No.	Range
515-560	12"



DIGITAL HEIGHT GAGE

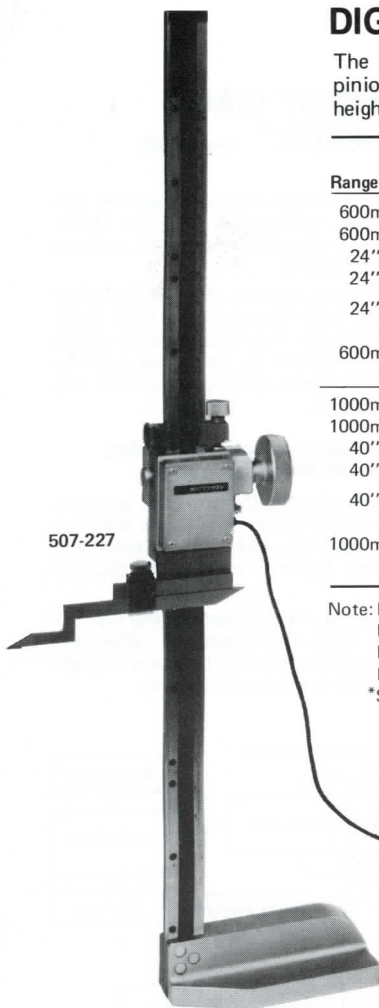
The 507 series digital height gage is based upon a rack and pinion/disc encoder design concept. Heavy-duty 520 series height gage with massive base is utilized in this series.

Range	Set No.	Combination of		Resolution
		Ht. Gage	Display	
600mm	507-161	(507-101	164-601*)	±0000.01mm
600mm	507-162	(507-101	164-701†)	±0000.01mm
24"	507-225	(507-103	164-642*)	±00.0005"
24"	507-227	(507-103	164-752†)	±00.0005"
24"/600mm	507-226	(507-103	164-647*)	±00.0005"
				±0000.01mm**
600mm/24"	507-163	(507-101	164-632*)	±0000.01mm
				±00.0001"***
1000mm	507-111	(507-102	164-601*)	±0000.01mm
1000mm		(507-102	164-701†)	±0000.01mm
40"	507-112	(507-104	164-642*)	±00.0005"
40"	507-241	(507-104	164-752†)	±00.0005"
40"/1000mm	507-243	(507-104	164-647*)	±00.0005"
	507-242			±0000.01mm**
				±0000.01mm
1000mm/40"	507-113	(507-102	164-632*)	±00.0001"***

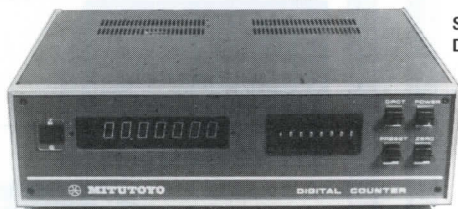
Note: No. 507-226 and 507-242 convert inch pulses into Metric equivalents. The height gage is engraved with .100" increment scale.

No. 507-163 and 507-113 convert Metric pulses into inch equivalents. The height gage is engraved with 1mm increment scale.

*S-type display unit. †E-type display unit.



E-TYPE
DISPLAY



S-TYPE
DISPLAY

The height gage features coarse and fine adjustments, carbide tipped scriber and inch or Metric scale on the main beam. Bright, high-intensity 7-segment digits are one of the display's features. Choice of E or S-type display.

**The last digit displayed is not continuous 0 to 9. It registers inch or metric equivalents.

(The inch/metric units are based upon inch scale and metric last digit is not continuous, while metric/inch units are composed of metric scale and therefore inch last digit is not continuous 0 to 9).



DIGITAL HEIGHT GAGE "QUICK READER" Series 192

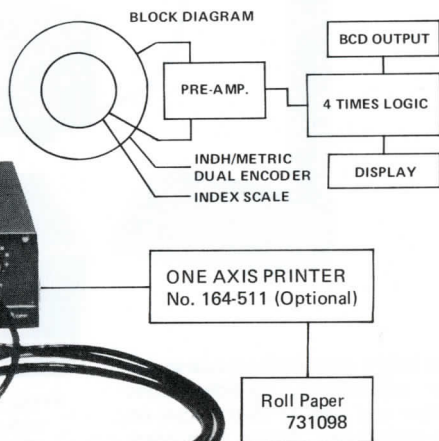
The MITUTOYO Height Gage embodies all the true value and high quality associated with the MITUTOYO name. It is a very versatile instrument, easy to operate in all its applications.

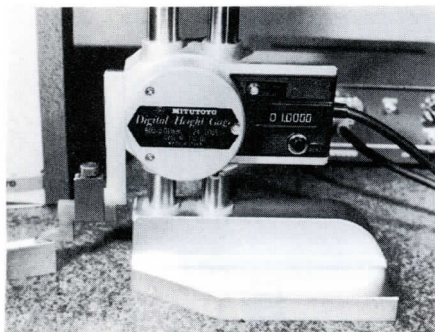
The unique direct reading feature of the MITUTOYO Height Gage results from the use of a dual inch/metric disc in the encoder. The disc provides direct readout of the measurement to either the inch or metric scale, and, the direct reading eliminates any need for a conversion unit.

24"/600mm Range, .0005"/0.01mm Resolution Digital Height Gage with Preset and Zero Set

BCD output is provided by the Control Unit which is standard with the Height Gage. See block diagram below. One-Axis Printer No. 164-511 (optional) can be connected to the Control Unit to record the measurements.

The cable connecting the Height Gage to the Control Unit is 6 feet long. With this length of cable, the Control Unit can be placed under the surface plate making more work area available for gaging.

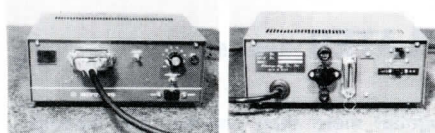


**ZEROSET BUTTON,
INCH/METRIC INDICATOR**

The Zero Set Button is immediately below the display. Above the display, a color-coded light indicates whether inch or metric mode has been selected. The Digital Height Gage is constructed with a large, heavy, satin-chrome-finished base which provides exceptional stability throughout the operating range. The dual inch/metric encoder is driven by a rack-and-pinion mechanism.

CONTROL UNIT, FRONT PANEL

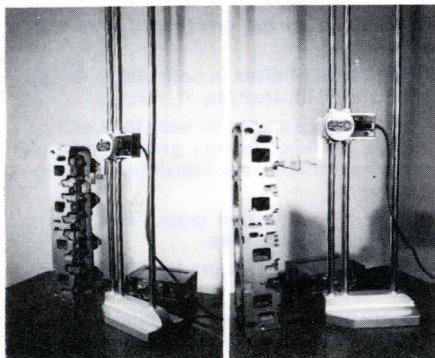
On-Off switch, zero set button, preset switch and channel selector are located on the front panel. The zero set button is an additional and separate button to the one located on the Height Gage. The numbers on the channel selector indicate the digit on the display. While selecting channel 3 for example, depress the preset switch three times to register 3 on the display. All digits can be preset by the channel selector and preset switch in this manner.



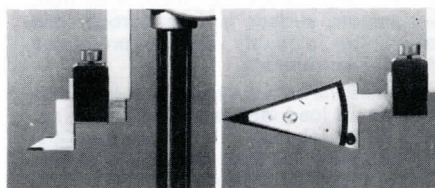
Control Unit: Front Panel, Rear Panel

CONTROL UNIT, REAR PANEL

Inch/Metric selector switch, direction switch and voltage selector (100V, 117V, 200V and 220V, $\pm 10\%$) are located on the rear panel. BCD output connection is provided for additional satellite units, such as No. 164-511 Printer.



Application Example: No. 192-933, 40"/1000mm with Center Master 900581

Furnished Scriber
900258*Optional Center Master
900581**Accuracy Specifications**

Under 4"	4 - 12"	12 - 20"
$\pm .0008"$	$\pm .0012"$	$\pm .0016"$

Range	No.	Resolution	Remarks	
24"/600mm	192-931	.0005"/0.01mm	Inch/Metric dual encoder	with Control Unit
40"/1000mm	192-933	.0005"/0.01mm	Inch/Metric dual encoder	with Control Unit



BLACK GRANITE SURFACE PLATES Series 517

F.O.B. Escondido, CA

MITUTOYO Black Granite Surface Plates meet or exceed Federal Specification GGG-P-463c. Each Surface Plate is shipped with a Certificate of Accuracy which guarantees its accuracy and verifies its traceability to the National Bureau of Standards.

MITUTOYO's new Surface Plates are made of black granite (hypersthene gabbro) which, compared with other natural granites, offers greatest strength, rigidity and hardness. These characteristics assure original accuracy over long service life. Also, their dull, velvet-smooth surface is less porous than most granites, a quality valued in protection to delicate instruments.

The Surface Plates are available in two classifications of load ratings—100 lb.-load/sq. ft. and 50 lb.-load/sq. ft.. These classifications determine the thickness of the plates. As stipulated in Federal Specification GGG-P-463c, surface plates shall have a thickness capable of supporting a total load equal to 50 lbs. for each square foot of surface-plate area, located at the center of the plate, without deflecting the plate along a

diagonal more than one-half the flatness tolerance. MITUTOYO has chosen to apply the same criterion to its 100 lb.-load/sq. ft. Surface Plates.

MITUTOYO offers the broadest line of Surface Plates.

- Widest range of sizes in both 100 lb.-load/sq. ft. and 50 lb.-load/sq. ft. ratings.
- Three tolerance grades for each load rating:
 - Grade AA—laboratory grade. Recommended for controlled-environment gaging rooms.

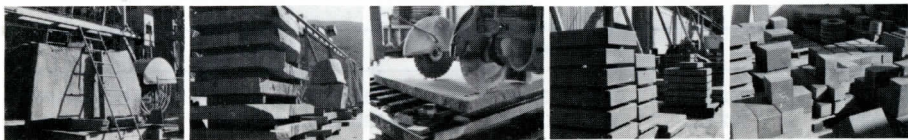
Grade A—inspection grade. For use in quality control centers.

Grade B—toolroom grade. General purpose applications.

Stationary or movable stands available for all sizes of MITUTOYO Surface Plates.

Surface plates, to sizes or specifications other than standard, available on special order.

ALL MITUTOYO Surface Plates shipped f.o.b. Escondido, California.



**BLACK GRANITE SURFACE PLATES** Series 517

No Ledge, 100 Lb-Load/Sq. Ft. (Federal Specification GGG-P-463c)

Size	AA Laboratory Grade				A Inspection Grade				B Shop Grade			
	T	Acc.	No.	Wt.	T	Acc.	No.	Wt.	T	Acc.	No.	Wt.
8x12"	3"	50	517-700	25	2"	100	517-800	20	2"	200	517-900	20
9x12"	3"	50	517-701	28	3"	100	517-801	28	2"	200	517-901	23
12x12"	3"	50	517-702	39	3"	100	517-802	39	3"	200	517-902	39
12x18"	4"	50	517-703	80	4"	100	517-803	80	4"	200	517-903	80
18x18"	4"	50	517-704	125	4"	100	517-804	125	3"	200	517-904	100
18x24"	4"	75	517-705	180	4"	150	517-805	180	4"	300	517-905	195
24x24"	5"	75	517-706	290	4"	150	517-806	240	4"	300	517-906	240
24x30"	5"	75	517-707	345	5"	150	517-807	345	4"	300	517-907	340
24x36"	6"	100	517-708	550	5"	200	517-808	470	4"	400	517-908	375
24x48"	8"	150	517-709	920	6"	300	517-809	750	5"	600	517-909	600
30x36"	6"	150	517-710	700	5"	300	517-810	560	5"	600	517-910	560
30x48"	8"	150	517-711	1200	6"	300	517-811	935	6"	600	517-911	935
30x60"	10"	200	517-712	1900	8"	500	517-812	1535	6"	1000	517-912	1150
36x36"	6"	150	517-713	850	5"	300	517-813	780	5"	600	517-913	780
36x48"	8"	200	517-714	1475	6"	400	517-814	1125	6"	800	517-914	1125
36x60"	10"	250	517-715	2300	8"	500	517-815	1840	6"	1000	517-915	1350
36x72"	12"	300	517-716	3200	10"	600	517-816	2700	8"	1200	517-916	2160
48x48"	8"	200	517-717	1950	6"	400	517-817	1465	6"	800	517-917	1465
48x60"	10"	300	517-718	3025	8"	600	517-818	2400	6"	1200	517-918	1800
48x72"	12"	350	517-719	4300	10"	700	517-819	3600	8"	1200	517-919	2880
48x84"	12"	400	517-720	5140	10"	800	517-820	4200	10"	1600	517-920	3355
48x96"	14"	500	517-721	6650	12"	1000	517-821	5750	10"	2000	517-921	5050
48x108"	14"	550	517-722	7600	12"	1100	517-822	6625	10"	2200	517-922	5400
48x120"	16"	700	517-723	9585	14"	1400	517-823	8050	12"	2800	517-923	7500
48x144"	16"	800	517-724	11900	14"	1600	517-824	10450	12"	3200	517-924	8900
60x60"	10"	300	517-725	3800	8"	600	517-825	3000	8"	1200	517-925	3100
60x72"	12"	400	517-726	5600	10"	800	517-826	4900	8"	1600	517-926	3594
60x96"	14"	500	517-727	8500	12"	1000	517-827	7375	10"	2000	517-927	6700
60x120"	16"	750	517-728	12000	14"	1500	517-828	11100	12"	3000	517-928	9900
60x144"	16"	900	517-729	13500	14"	1800	517-829	12350	12"	3600	517-929	10500
72x72"	12"	500	517-730	6500	10"	1000	517-830	5575	10"	2000	517-930	5575
72x96"	14"	600	517-731	10300	12"	1200	517-831	9075	10"	2400	517-931	7200
72x120"	16"	750	517-732	14400	14"	1500	517-832	12900	12"	3000	517-932	11055
72x144"	18"	1100	517-733	19440	16"	2200	517-833	17700	14"	4400	517-933	15635

Note: T = Thickness, Acc. = Accuracy in millionths of an inch

Select 100 Lb-Load/Sq. Ft. (above) or 50 Lb-Load/Sq. Ft. (following page).

Also, select Stationary or Caster Steel Stand (following page).



SELECTION GUIDE

100 lb. load/sq. ft.

Industry's traditional practice.

50 lb. load sq. ft.

Alternative choice
Less initial cost, same accuracy.

100 lb. load/sq. ft., or 50 lb. load sq. ft.?

The federal specifications GGG-P-463C stipulate that the surface plate shall have a thickness capable of supporting a total normal load equal to 50 pounds for each square foot of surface plate area load in the center of the plate without deflecting the plate along a diagonal or diameter more than one-half the flatness tolerance.

The 50 lb. load is thus required by the specifications. However, in actual practice many users considered 100 lb. load more desirable and did purchase 100 lb. load surface plates.

The current trend is to reconsider the value of the 50 lb. load plates since they provide identical accuracy at more economical price range.

BLACK GRANITE SURFACE PLATES Series 517

No Ledge, 50 lb-Load/Sq. Ft. (Federal Specification GGG-P-463c)

Size	AA Laboratory Grade				A Inspection Grade				B Shop Grade			
	T	Acc.	No.	Wt.	T	Acc.	No.	Wt.	T	Acc.	No.	Wt.
8x12"	2"	50	517-740	20	2"	100	517-840	20	2"	200	517-940	20
12x18"	3"	50	517-741	63	3"	100	517-841	60	2"	200	517-941	43
18x24"	4"	75	517-742	125	3"	150	517-842	167	2"	300	517-942	64
24x36"	5"	100	517-743	343	4"	200	517-843	417	3"	400	517-943	258
36x48"	6"	200	517-746	858	5"	400	517-846	1000	4"	800	517-946	685
36x72"	9"	300	517-747	1801	7"	600	517-847	2250	6"	1200	517-947	1545
48x72"	8"	350	517-748	2403	7"	700	517-848	2667	6"	1400	517-948	2150

Note: T = Thickness, Acc. = Accuracy in millionths of an inch

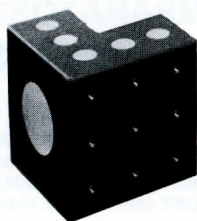
STATIONARY STEEL STANDS



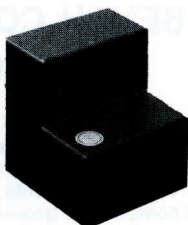
Size	No.	Wt.	Size	No.	Wt.
12x18"	517-950	42	48x48"	517-967	190
18x18"	517-951	46	48x60"	517-968	200
18x24"	517-952	50	48x72"	517-969	205
20x30"	517-953	60	48x84"	517-970	320
24x24"	517-954	73	48x96"	517-971	335
24x30"	517-955	65	48x108"	517-972	350
24x36"	517-956	70	48x120"	517-973	365
24x48"	517-957	90	48x144"	517-974	430
24x60"	517-958	100	60x60"	517-975	245
30x30"	517-959	80	60x72"	517-976	340
30x36"	517-960	85	60x96"	517-977	375
30x48"	517-961	95	60x120"	517-978	455
30x60"	517-962	105	60x144"	517-979	480
36x36"	517-963	92	72x72"	517-980	380
36x48"	517-964	105	72x96"	517-981	465
36x60"	517-965	160	72x120"	517-982	510
36x72"	517-966	180	72x144"	517-983	530



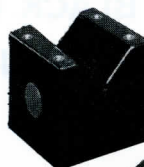
Angle Blocks



517-774



517-862

V Blocks
517-884Parallels
517-852

ACCESSORIES

BLACK GRANITE SURFACE PLATES Series 517

ANGLE BLOCKS (With or Without Inserts)

Grade	Production*			Master **			
Size	2 Face	4 Face		2 Face	4 Face		Case
			w/Inserts			w/Inserts	
4 x 4 x 4"	517-867	517-861	517-873	517-767	517-761	517-773	050021
6 x 6 x 6"	517-868	517-862	517-874	517-768	517-762	517-774	050022

* Production accuracy .0001" per 6".

** Master accuracy .00005" per 6".

PARALLELS (Pair)

Grade	Production			Master			
Size	Accuracy	2 Face	4 Face	Accuracy	2 Face	4 Face	Case
¾ x 1 x 6"	.00006"	517-855	517-850	.00003"	517-755	517-750	050027
¾ x 1½ x 9"	.00008"	517-856	517-851	.00004"	517-756	517-751	050028
1 x 2 x 12"	.0001"	517-857	517-852	.00006"	517-757	517-752	050029

V-BLOCKS (Matching Pair)

Grade	Production *		Master **		
Size	V-1	V-5	V-1	V-5	Case
2 x 2 x 2½"	517-887	517-883	517-787	517-783	050039
3 x 3 x 3"	517-888	517-884	517-788	517-784	050040
6 x 6 x 6"	517-889	517-885	517-789	517-785	050041

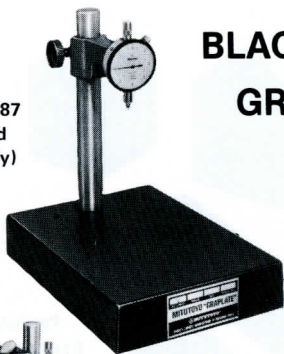
* Production accuracy .0001" per 6".

** Master accuracy .00005" per 6".

BLACK GRANITE SURFACE PLATES

GRANITE BENCH COMPARATORS & BENCH CENTERS

517-987
(Stand
only)



517-989
(Stand
only)



517-985
(Stand
only)



517-988
(Stand
only)



A complete line of bench centers and comparators features black granite bases for the ultimate in accuracy and long, dependable service. Many models provide a comparison gaging unit tailored for every application.

Select the best suited MITUTOYO dial indicator for your comparison work. MITUTOYO offers over 100 AGD-type standard indicators. (Bench centers and comparators are supplied without indicator.)

BENCH COMPARATOR No. 517-987

Size 8 x 12 x 2". Granite base has flatness accuracy of $\pm .0001$ " entire top surface.

A 1-1/4" DIA. solid steel 10" high column is furnished to hold a dial indicator. Vertical capacity 7". Throat clearance 3-15/16". Weight 25 lbs.

BENCH COMPARATOR No. 517-989

Triangular granite base 8 x 12 x 2" has a flatness accuracy of $\pm .0001$ " entire top surface.

The comparator is furnished with 7/8" DIA. solid steel column 10" high to hold a dial indicator. The throat clearance is fully adjustable from 1" to 11" by a horizontal arm. Weight 20 lbs.

BENCH COMPARATORS

Code No. 517-984 Size 6 x 6 x 2"

Code No. 517-985 Size 6 x 12 x 2"

No. 517-984 (6 x 6") has its upright column on one corner 1/2" from both edges. The column is 7" in height 5/8" DIA. and has a horizontal cross arm to adjust throat clearance. The flatness accuracy on the top surface is $\pm .0001$ ".

No. 517-985 (6 x 12") has its column on the center (see photo).

BENCH COMPARATOR No. 517-988

High accuracy grade bench comparator. Granite base has flatness of $\pm .000050$ ". Size 12 x 18 x 4".

A 1-1/4" DIA. solid steel 10" high column is furnished to hold a dial indicator. Vertical capacity 7". Throat clearance 3-15/16". Weight 85 lbs.



517-991
(Stand only)

BENCH CENTER No. 517-991

Triangular granite base 12 x 20 x 3" with flatness accuracy of $\pm .0001$ ".

Solid steel 7/8" DIA. column, with a 10" vertical capacity and 1 to 11" throat adjustable capacity, is furnished to hold a dial indicator. This bench center is furnished with a 9/16" wide x 20" long T-slot located 2-1/2" from the front side. T-slot is held to an accuracy of .0005".

Steel head and tailstocks have a capacity between centers of 8" DIA. x 12" long. 75 lbs.

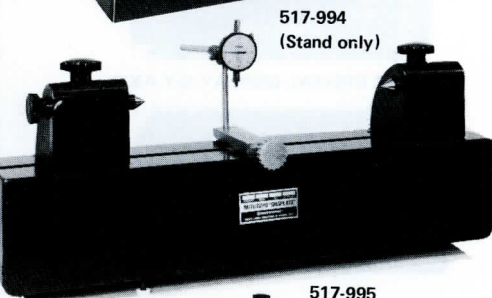


517-993
(Stand only)

BENCH CENTER No. 517-993

Rectangular granite base 12 x 18 x 4" with flatness accuracy $\pm .000050$ ".

Solid steel 7/8" DIA. column, with a vertical capacity of 10" and throat clearance of 1 to 11", is furnished to hold a dial indicator. The unit is furnished with 9/16" wide 18" long T-slot with an accuracy of .0005". T-slot is located 2-1/2" from the 18" edge of the base. Steel head and tailstocks with capacity between centers of 8" DIA. x 10" long. 96 lbs.

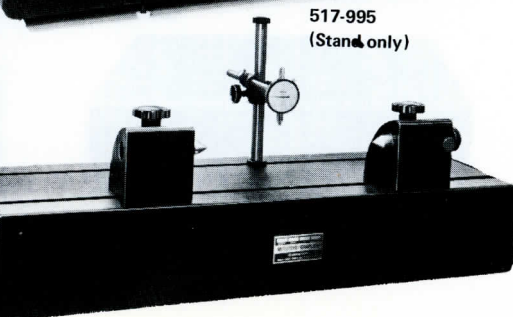


517-994
(Stand only)

BENCH CENTER No. 517-994

Rectangular granite base 6 x 6 x 30" with a top surface accuracy of $\pm .0001$ ".

Steel 3/8" DIA. column mounted on sliding carriage, with a vertical capacity of 7" and throat clearance of 9" adjustable, is furnished to hold a dial indicator. The unit is furnished with 9/16 x 30" long T-slot with an accuracy of $\pm .001$ ". The T-slot is located in center of top surface. Steel head and tailstocks have 8" DIA. x 22" long capacity between centers. Weight 135 lbs.



517-995
(Stand only)

BENCH CENTER No. 517-995

Rectangular granite base 12 x 36 x 6" with a top surface accuracy of $\pm .0001$ ".

Tubular steel 7/8" DIA. column, with vertical capacity of 10" and throat clearance of 1 to 11", is furnished to hold a dial indicator. The unit is furnished with two 9/16" wide x 36" long T-slots which have accuracy of $\pm .001$ ". The T-slots are located 2-1/2" from both 36" long edge and are 7" apart, parallel and straight within .001".

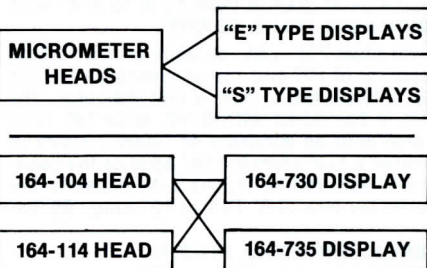
Steel head and tailstocks have 8" DIA. x 28" long capacity between centers. 280 lbs.



"DIGI-MATIC" Series 164

The MITUTOYO "Digi-Matic" Series 164 consists of combinations of micrometer heads and digital displays. The "Digi-Matic" can be used in conjunction with profile projectors and various microscopes where X-Y table functions are an essential part of the measurements.

MITUTOYO offers two basic types of digital displays, as illustrated below. Both can be connected with the same micrometer heads, but, not with micrometer heads Nos. 164-104 and 114 which are intended for specific displays featuring double inch/metric tracks in the encoder.



Both 164-730 and 735 displays are inch/metric switchable types, and are shown on this page. 164-730 is for single axis, while 164-735 is for X-Y double axes applications.

FEATURES:

"E"-type Displays

1. Zero set
2. Directional switch
Plus (+) or Minus (-) indication irrespective to the direction of micrometer head.

"S"-type Displays

In addition to above features;

3. Preset
4. BCD output TTL level
For printer, Tolerance Indicating Unit, computer and other satellite units hook-up.

RESOLUTION:

Both "E"-type and "S"-type Displays .00005" or 0.001mm, or both.



164-730



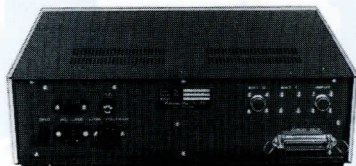
"E"-TYPE DIGITAL DISPLAY SINGLE AXIS



164-735



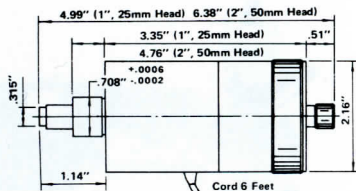
"E"-TYPE DIGITAL DISPLAY X-Y AXIS



164-641



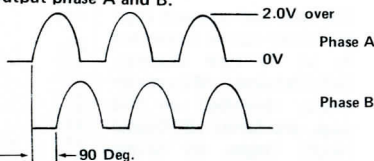
"S"-TYPE DIGITAL DISPLAY

**MICROMETER HEAD SPECIFICATIONS:****MECHANICAL:**

1. Carbide-tipped non-rotating spindle.
2. Spindle tip: flat .315" dia.
3. Disc encoder housed in the mike head.
4. Reference graduations on the thimble.
5. Overall accuracy ± 80 millionths inch for 1", ± 120 millionths for 2" model.
6. Code length 6 feet.

ELECTRONICAL:

1. Output phase A and B.



2. Output impedance below 2 k Ω
3. Output pulse 125/Rev. for inch or metric, 100/127/Rev. for inch/metric micrometer head.
4. Supplied power DC5V \pm 0.1V 60mA or less.

APPLICATION EXAMPLE**TOLERANCE INDICATING UNIT 164-652**

The Tolerance Indicating Unit, shown here is used in conjunction with the "S"-type display units, and allows the operator to manually set predetermined tolerance band.

In this particular example, the micrometer head is indicating 12.38500" on the display. If there is a tolerance on this value, for instance +.0005" and -.0002", then, these limits can be preset by the Tolerance Indicating Unit. Select 12.38550" on the upper tolerance limit, by the thumb wheel, which is +.0005" of the intended value, and select 12.38480" on the lower limit, which is -.00002" of the value. Any dimension between these limits will register a green light (OK), exceeding either side of the limit will trigger Under or Over light.



164-103

"DIGI-MATIC" Series 164 Heads

SELECTION GUIDE

164-101
0-25mm**Metric Head**

Both heads listed here can be connected to 164-620 (S type), 164-630 (S type metric/inch switchable), 164-720 (E type) and 164-725 (E type) X-Y 2 axis display units.

The head is made strictly in metric specifications.

The smallest reading on the thimble is .005mm, flush reading.

164-111
0-50mm164-103
0-1"164-113
0-2"**Inch Head**

Strictly inch specified micrometer head. Connected to 164-204 (inch only).

164-104
0-25mm/0-1"**Metric/Inch Heads**

Most inch/metric conversion is made by a PC board. These two micrometer heads, however, house a double track (inch and metric) disc encoder which originate either metric or inch counts.

164-114
0-50mm/0-2"

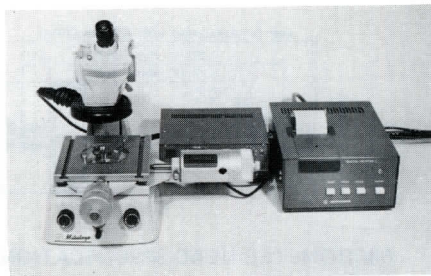
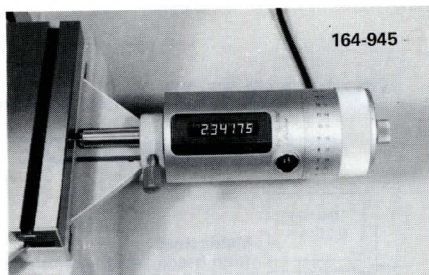
Two sensing/grating units in the micrometer thimble are used alternately to create metric or inch pulses.

These two inch/metric mike heads can be connected to "E"-type display units, No. 164-730 and 164-735 only.

"S" Type DISPLAY UNIT 164-641

Lower Tolerance Limit Under Ok Over Upper Tolerance Limit

TOLERANCE INDICATING UNIT 164-652



APPLICATION EXAMPLE

The Self-Contained Digital Micrometer Head No. 164-945, is applied to the Toolmaker's Microscope, along with the Digital Printer, No. 164-512.

DIGITAL PRINTER

Series 164

The new and compact Digital Printer can be connected to all "S"-type Displays. Self-Contained Micrometer Heads, described on this page, and Series 192 Digital Height Gages, all having BCD outputs.

The first three digits on the roll paper, shown here, are the sequence of measurements. The decimal point can be manually set, and the switch to move decimal point is located on the rear panel. Foot Switch is optional.

000	000000
001	000000
002	000000
003	000000

004	- 000005
005	- 000010
006	- 000015
007	- 000020
008	- 000025
009	- 000030
010	- 000030
011	000100
012	000150
013	000125
014	000105
015	000085
016	000075
017	000065

018	- 122260
019	- 122305
020	- 122385
021	- 124750
022	- 127085
023	- 127340
024	- 126205
025	- 127195

CONTO UNIT: Front Panel, Rear Panel

"DIGI-MATIC" Series 164

With Self-Contained Digital Micrometer Heads

The unique Self-Contained Digital Micrometer Heads are available in 0-2" or 0-50mm continuous range with resolutions of .00005" or 0.001mm, respectively. The Head is furnished with a control unit, which features a BCD output. Through the output, other additional units, such as the Digital Printer shown on this page, can be connected.

Features

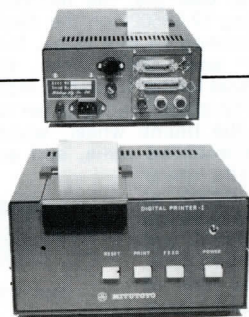
Zero-Set: Featured on the micrometer, next to display. Depress the button for zero-set. The control unit also provides zero-set toggle switch.

Preset: All digits can be preset by the control unit.

ALL "S"-TYPE DISPLAYS

SELF-CONTAINED MIKE HEADS

DIGITAL HEIGHT GAGES



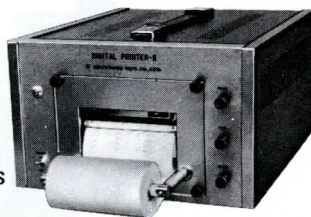
FOOT SWITCH
164-315

One Axis Digital Printer 164-511
Two Axes Digital Printer 164-512

164-511

**AXIS SELECTOR
UNIT 164-311**X - Y READING CAPABILITY
WITH X - Y SELECTOR SWITCH"E" or "S" TYPE
SINGLE DISPLAY

Front

**DIGITAL
PRINTER
FOR
"S" TYPE
DISPLAYS**
164-501**"DIGI-MATIC" Series 164 Sets**

Consisting of

Type

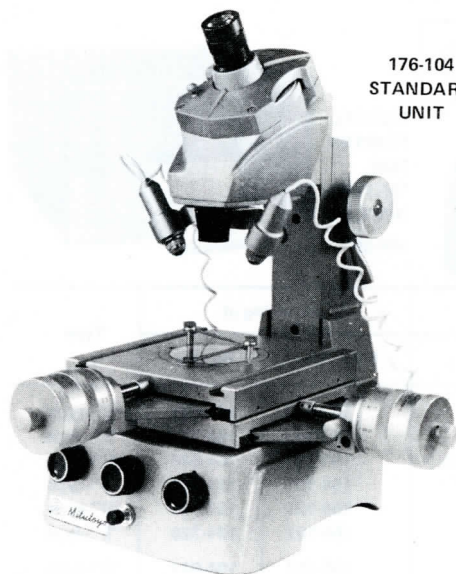
Range	No.	Resolution	Mike Head	Display	Type
0-1"	164-917	.00005"	164-103	164-641	"S"-type
0-1"	164-918	.00005"	164-103	164-751	"E"-type
0-1"/0-25mm	164-916	.00005"/0.001mm	164-103	164-646	"S"-type
0-25mm/0-1"	164-906	0.001mm/.00001"	164-101	164-630	"S"-type
0-25mm	164-904	0.001mm	164-101	164-620	"S"-type
0-25mm	164-905	0.001mm	164-101	164-720	"E"-type
0-2"	164-937	.00005"	164-113	164-641	"S"-type
0-2"	164-938	.00005"	164-113	164-751	"E"-type
0-2"/0-50mm	164-936	.00005"/0.001mm	164-113	164-646	"S"-type
0-50mm/0-2"	164-927	0.001mm/.00001"	164-111	164-630	"S"-type
0-50mm	164-925	0.001mm	164-111	164-620	"S"-type
0-50mm	164-926	0.001mm	164-111	164-720	"E"-type
0-1"/0-25mm	164-914	.00005"/0.001mm	164-104	164-730	"E"-type
0-1"/0-25mm	164-915	.00005"/0.001mm	(2) 164-104	164-735	"E", X-Y
0-2"/0-50mm	164-934	.00005"/0.001mm	164-114	164-730	"E"-type
0-2"/0-50mm	164-935	.00005"/0.001mm	(2) 164-114	164-735	"E", X-Y

"DIGI-MATIC" Series 164 Self-Contained Display Unit

Range	No.	Resolution	Description
0-2"	164-945	.00005"	One axis model with control unit
0-2"	164-946	.00005"	Two axes model with control unit (Two heads)
0-50mm	164-943	0.001mm	One axis model with control unit
0-50mm	164-943	0.001mm	Two axes model with control unit (Two heads)

ACCESSORIES

No.	Description	No.	Description
164-501	One axis printer for "S"-type display	164-511	One axis printer for "S" & "E"-type displays
164-502	Two axes printer for "S"-type display	164-512	Two axes printer for "S" & "E"-type displays
164-312	Foot switch for above printers	164-315	Foot switch for above printers
164-313	Hand switch for above printers	164-311	X-Y axis selector unit
		164-652	Tolerance indicating unit for "S"-type displays



**176-104
STANDARD
UNIT**

TOOLMAKERS MICROSCOPE

Series 176

MITUTOYO's Toolmaker's Microscope is an ideal and indispensable measuring instrument for inspection of virtually all types of workpieces. It is a general purpose, heavy-duty Microscope with a remarkable measuring capability.

The Standard Microscope No. 176-104 is a complete working unit and performs most of inspection requirements without adding accessories.

The Standard Toolmaker's Microscope No. 176-104 includes:

1. Basic Unit.
2. 2x2" travel Microstage with two large Micrometer Heads reading directly in tenths.
3. 30X Lens (15X Eyepiece Lens and 2X Objective Lens).
4. 90 degree broken cross-hair Reticle.
5. Surface Illuminator.
6. Three additional Lenses for Illuminator and substage lamps.
7. Two additional Illuminator Bulbs.
8. Plastic dust cover and operation manual.
9. Plus, all the standard features:

**NO. 176-104 STANDARD UNIT WITH 30X
LENS AND 2 X 2" .0001" READING
MICROSTAGE (176-131).**

- Individually variable intensity featured on both Illuminator and Substage lights.
- Large Stage dimensions (6x6") and travel (2x2") accept most workpieces.
- Crossed roller bearings and key way stage construction ensure a true linear traverse in X and Y axes.
- Large Micrometer Head reads directly in tenths without Vernier, and has dual directional graduations in black and red.
- Every thousandth is numbered in black and red for easy reading.
- Large dovetail assures Z axis squareness in relation to the Stage surface.
- The Micrometer Thimble rotates 360 degrees, allowing the Micrometer Head to start from zero point.
- The Eyepiece Protractor is graduated in 1 degree; with the Vernier, an angle can be measured to 6 minutes.

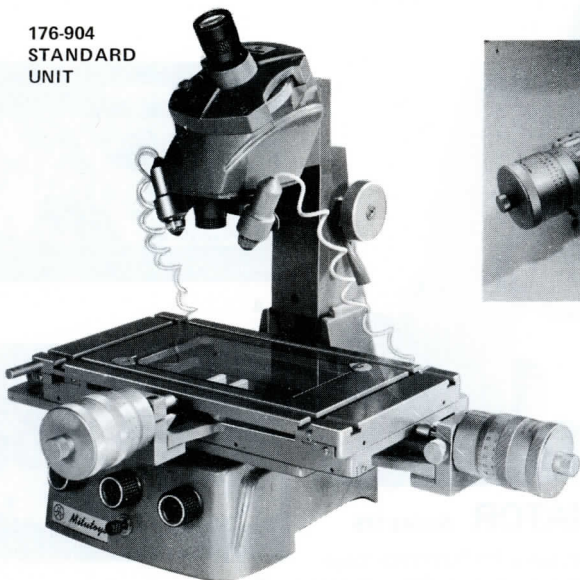


10X Objective Lens (176-137)

Objective Lens	Eyepiece Lens		
	(176-115) 10X	(176-116) 15X	(176-117) 20X
2X (176-138)	20X	30X	40X
5X (176-139)	50X	75X	100X
10X (176-137)	100X	150X	200X



176-904
STANDARD
UNIT



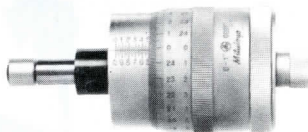
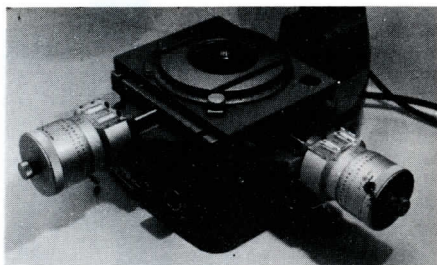
NO. 176-904 STANDARD UNIT WITH 30X
LENS AND 4 x 2" .0001" READING
MICROSTAGE (172-218)

TOOLMAKERS MICROSCOPE

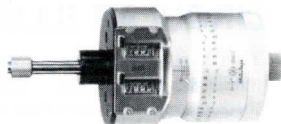
Series 176

4" X-axis, 2" Y-axis travel microstage is also available for toolmaker's microstage to measure larger workpieces. This standard unit No. 176-904 is a well accepted model as a general purpose microstage. The standard magnification is 30X. Micrometer head range is 0-1" with .0001" smallest graduation on the thimble.

The 4 x 2" microstage shown above is furnished with No. 152-391 and 152-392 standard micrometer heads. Depending upon the application, these mike heads can be interchanged with any one of the mike heads shown here or 164 series "Digit-Matic" which features 7-segment digital displays.

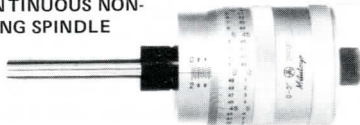


0-1" .0001" 152-391 OR 392



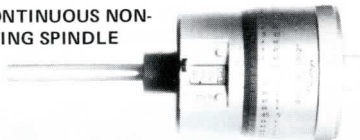
0-1" .0001" 252-392

0-2" CONTINUOUS NON-
ROTATING SPINDLE



0-2" .0002" 197-201

0-2" CONTINUOUS NON-
ROTATING SPINDLE



0-2" .0002" 297-201

Standard X-Y microstage 176-131 and 172-218 shown here are furnished with 152-391 and 152-392 0-1" travel .0001" reading mike heads. These micrometer heads can be readily interchanged with a pair of 252-392 (see illustrations above) which features dual directional counter readings. For 0-2" continuous linear stage movements, 197-201 or 297-201 is highly recommended.



CIRCULAR ILLUMINATOR Series 176

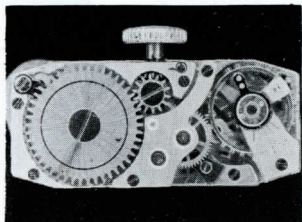
This special illuminator is prepared for MITUTOYO Toolmaker's Microscope, and provides shadow-free image throughout the entire field of view.

It features a double ring of "cold light" illumination that is housed in an aluminum reflector.

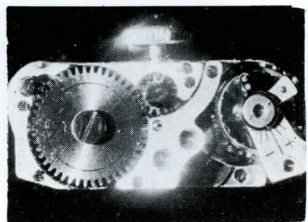
Purpose of this attachment for MITUTOYO Microscope is to produce bright, cool, uniform and above all, "shadow-free" illumination.

A photo comparison is made to indicate the difference, photo A (top) is the view with this illuminator. Spilling into holes, indentations and crevices, it provides the viewer a complete specimen under shadow-free illumination.

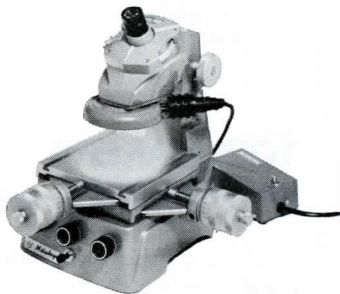
Because of the very same feature, however, this illuminating method is not recommended when minute scratches, shallow recesses, surface texture and the like are to be inspected.



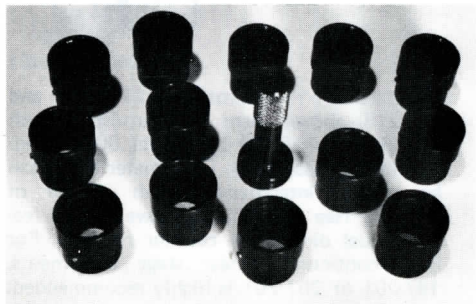
A



B

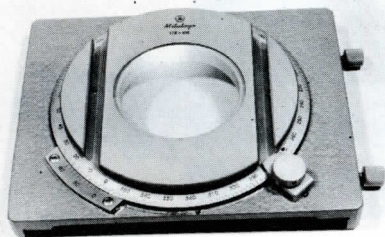


MITUTOYO Toolmakers Microscope 176-104 is shown with Circular Illuminator 176-151. Both Microscope and Illuminator take 115V line power.

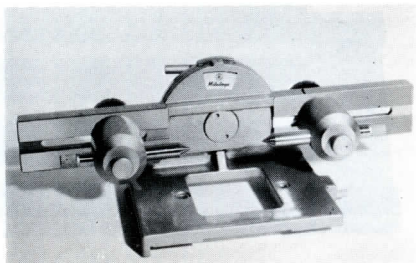


INTERCHANGEABLE RETICLES

The toolmaker's microscope is furnished with a standard cross hair line reticle. The reticle can be readily interchanged with more than a dozen of additional special reticles depending upon the measuring application. The threaded knob for reticle replacement is supplied with the microscope.



Rotary Measuring Stage (176-106)
For 2 x 2" Stage

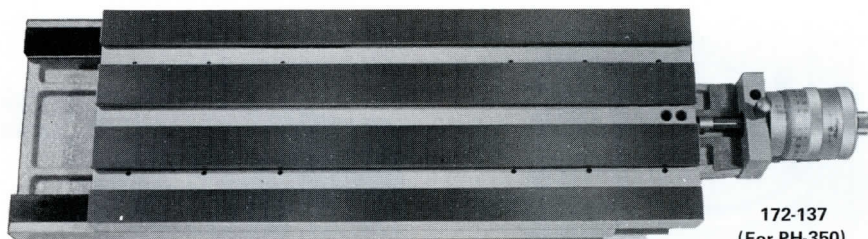


Swivel Center Support (176-105)
For 2 x 2" Stage

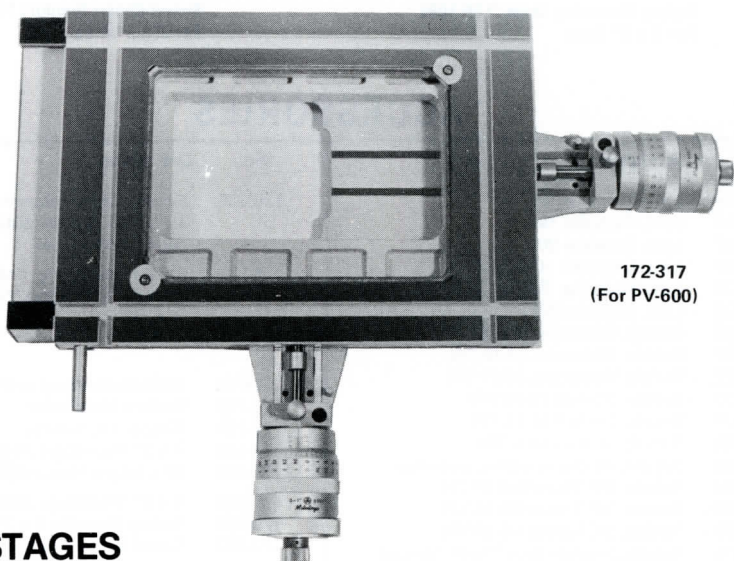
ACCESSORIES

No.	Description	No.	Description
176-115	Lens, Eyepiece 10X	176-105	Swivel Center Support, Max. swing 1½". Max. Center distance 9½". Inclination ±10 degrees
176-116	Lens, Eyepiece 15X	176-106	Rotary Measuring Stage, Main Scale graduation 1 degree Vernier Scale to 6 minutes
176-117	Lens, Eyepiece 20X		
176-137	Lens, Objective 10X		
176-138	Lens, Objective 2X		
176-139	Lens, Objective 5X		
176-120	Reticle, Whitworth 60-26 TPI	176-107	Hold down clamp with "T"
176-121	Reticle, Whitworth 24-18 TPI	176-108	Surface Illuminator
176-122	Reticle, Whitworth 16-11 TPI	176-151	Circular Illuminator
176-123	Reticle, Unified 80-28 TPI	176-131	2 x 2" Microstage .0001"
176-124	Reticle, Unified 24-14 TPI	176-136	50 x 50mm Microstage 0.001mm
176-125	Reticle, Unified 13-0 TPI	172-218	4 x 2" Microstage .0001"
176-126	Reticle, 90 degree broken cross-hair	172-196	Rotary Stage for 4 x 2" stage
176-127	Reticle, NF Thread 80-28 TPI	172-197	Swivel Center Support for 4 x 2" microstage
176-128	Reticle, NF Thread 24-14 TPI		
176-129	Reticle, NC Thread 13-10 TPI	152-391	0-1" .0001" Mike Head X-axis
176-112	Reticle, Involute Gear Tooth, Normal Rack MO. 1-1.0 pressure angle 20 degrees	152-392	0-1" .0001" Mike Head Y-axis
176-130	Reticle, Involute Gear Tooth, Normal Rack MO. 1-1.0 pressure angle 14 degrees, 30 minutes	252-392	0-1" .0002" Double Counter Micrometer Head
176-135	Reticle, Concentric Circle, .010" increment, .200" Max. dia.	197-201	0-2" .0002" Mike Head
		297-201	0-2" .0002" Mike Head

Standard Unit No.	Magnification	Microstage		Note
		Travel	Graduation	
176-104	30X	2 x 2"	.0001"	Complete with substage & surface illuminators
176-103	30X	50 x 50mm	0.001mm	Complete with substage & surface illuminators
176-904	30X	4 x 2"	.0001"	Complete with substage & surface illuminators



172-137
(For PH-350)



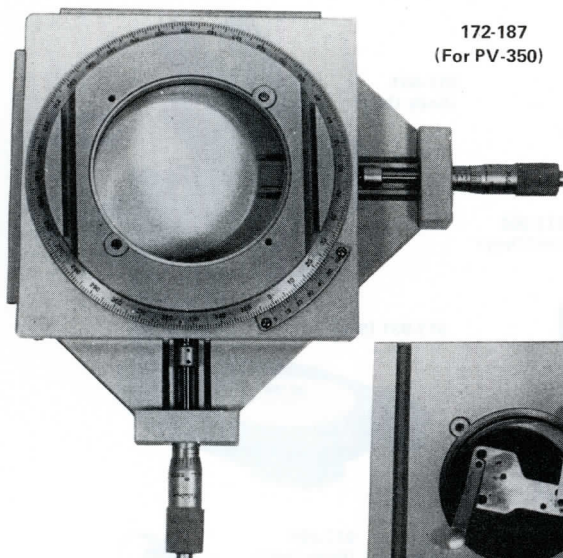
172-317
(For PV-600)

MICROSTAGES

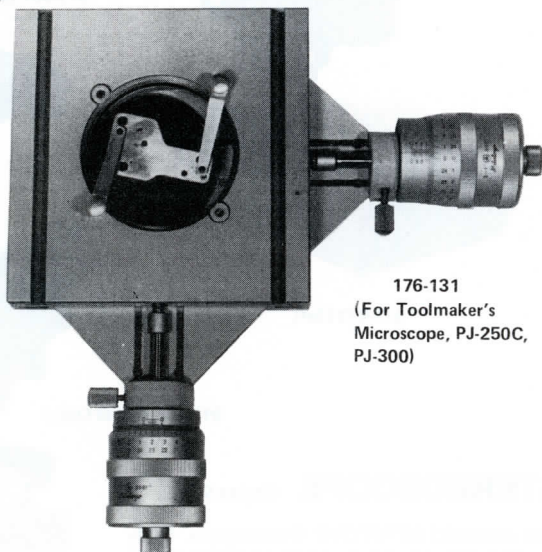
Series 172

Stage		No.	Mike Head		Glass Plate Dimension	Note
Travel	Dimension		Range	Graduation		
6" (1 axis)	16 x 6"	172-137	0-1"	.0001"	-----	for PH-350
2 x 2"	6 x 6"	172-187	0-1"	.001"	3.93" dia.	for PV-350
2 x 2"	6 x 6"	172-189	0-1"	.001"	3.39" dia.	for PV-350
2 x 4"	11 x 6"	172-218	0-1"	.0001"	6 x 3.62"	for PJ-300
2 x 6"	16 x 6"	172-219	0-1"	.0001"	7.5 x 3.62"	for PJ-300
2 x 2"	8½ x 8"	172-313	0-1"	.0001"	5.11" dia.	for PV-600
2 x 4"	11 x 8"	172-317	0-1"	.0001"	7.09 x 5.12"	for PV-600
2 x 2"	6 x 6"	176-131	0-1"	.0001"	3.14" dia.	for PJ 250,

PJ-300 & Toolmakers Microscope



172-187
(For PV-350)



176-131
(For Toolmaker's
Microscope, PJ-250C,
PJ-300)

MICROSTAGES

Series 172, 176

Stage		No.	Mike Head		Glass Plate Dimension	Note
Travel	Dimension		Range	Graduation		
150mm (1 axis)	400x150mm	172-136	0-25mm	.005mm	-----	for PH-350
50 x 50mm	150x150mm	172-186	0-25mm	.01mm	100mm dia.	for PV-350
50 x 50mm	150x150mm	172-188	0-25mm	.01mm	100mm dia.	for PV-350
50 x 100mm	280x150mm	172-193	0-25mm	.005mm	150 x 90mm	for PJ-300
50 x 150mm	400x150mm	172-194	0-25mm	.005mm	190 x 90mm	for PJ-300
50 x 50mm	220x200mm	172-312	0-25mm	.005mm	130mm dia.	for PV-600
50 x 100mm	280x200mm	172-316	0-25mm	.005mm	180 x 130mm	for PV-600
50 x 50mm	150x150mm	176-136	0-25mm	.005mm	80mm dia.	for PJ-250

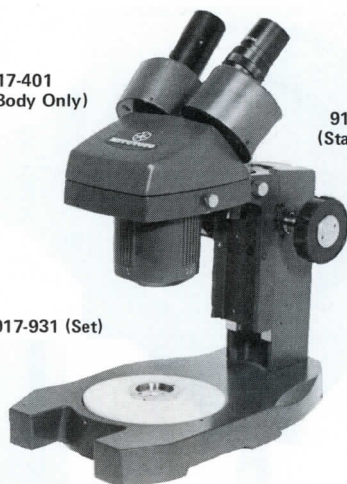
PJ-300 & Toolmakers Microscope

917-401
(Body Only)



917-200
(Stand Only)

917-401
(Body Only)



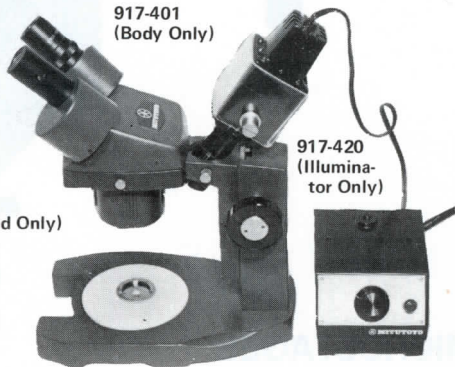
917-100
(Stand Only)

917-931 (Set)

917-932 (Set)

917-401
(Body Only)

917-100 (Stand Only)



917-420
(Illumina-
tor Only)

917-931 (Set) with 917-420 Illuminator

STEREOSCOPE Series 917

The standard MITUTOYO Stereoscope, Body No. 917-401, can be mounted on either one of three available stands, No. 917-100, 200 and 300 as illustrated above.

The standard body, No. 917-401 with 1X and 2X objective lenses, can be interchanged with the optional body which features 2X and 4X objective lenses for higher magnifications.

SET NO. 917-932

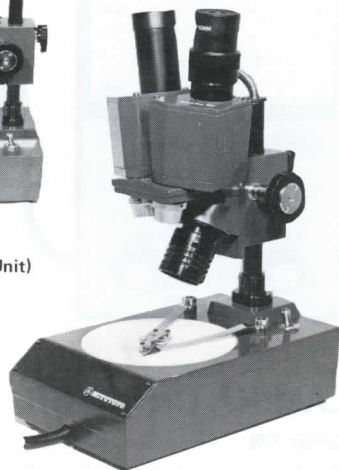
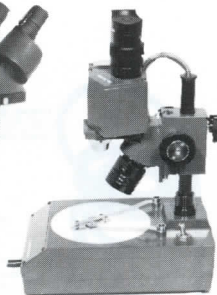
Features a variable-intensity surface and sub-stage illuminations. The Stereoscope offers 10X and 20X magnifications for general purpose inspection. The built-in slip clutch mechanism holds optical body in position and insures sharply focused, bright images.

SET NO. 917-931

A combination of No. 917-401 standard body and No. 917-100 stand. The stand offers no incident illumination. However, it features a special coupling where the optional illuminator, No. 917-420, can be securely mounted. The illuminator features variable intensity.



917-401 (Body Only)

917-300
(Stand Only)917-933 (Set) Combination
of Stereoscope and Stand917-930
(Complete Unit)**SET NO. 917-933**

The standard body No. 917-401 and counter-balanced, industrial post No. 917-300 for a greater reach. This set offers no incident light. The optional variable-intensity illuminator, shown on the preceding page, is recommended.

SET NO. 917-930

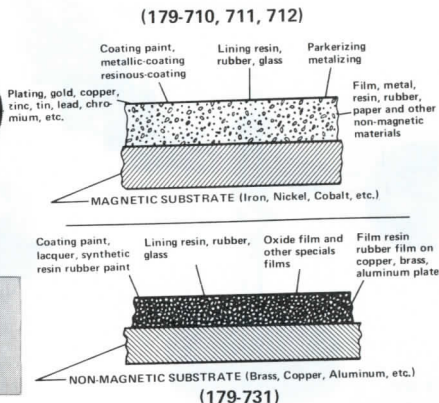
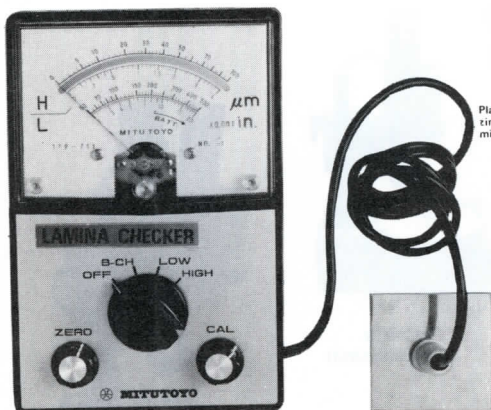
A complete unit with built-in, variable-intensity illuminator and hold-down clips. Available magnification is 15X only. Working distance-3.35". Maximum specimen height-2.29".

MAGNIFICATIONS

Selection	Body No.	Objective Lens	Eyepiece Lens		
			Standard	Optional	
			917-110(10X)	917-115(15X)	917-120(20X)
Standard Body	917-401	1X, 2X	10X, 20X	15X, 30X	20X, 40X
Optional Body	917-403	2X, 4X	20X, 40X	30X, 60X	40X, 80X

Selection	Set No.	Consisting of		Magnifications	Remarks
		Body	Stand		
1	917-930			15X	With Surface Illuminator
2	917-931	917-401	917-100	10X, 20X	
3	917-932	917-401	917-200	10X, 20X	
4	917-933	917-401	917-300	10X, 20X	With Surface and Substage Illuminators

For Set Numbers 917-931 and 917-933, Variable-Intensity Illuminator 917-420 is recommended.



LAMINA CHECKER

Series 179

Battery operated inch/metric dual reading Lamina Checker is a compact coating thickness gage. It measures the thickness of non magnetic coating or a layer of material on magnetic substrates.

The reading scale consists of two ranges; the finer range marked as "H" reads from 0 to .004" (0-100 Micron mm), the other reads from .002" to .020" (50-500 Micron mm).

When the selector switch is on B-CH (for battery check), the indicating hand must go beyond the "Batt" (for battery) mark on the scale. The probe is operated on eddy current principle, and has retractable preloaded sensing core.

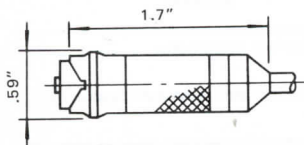
Operation

- 1) Check battery by selecting "B-CH" for battery check. Observe indicating hand.
- 2) Place probe on the furnished metal piece. Depress the probe.
- 3) Adjust "Zero" knob on the panel so that the indicating hand does indicate "0" on the scale.
- 4) Insert calibrated film provided between the probe and the metal. Choose 100 Micron mm sheet and select "High" range.
- 5) Bring the indicating hand to read 100 by adjusting "Cal" knob for calibration.
- 6) Change film sheet from 100 to 50 micron mm, the hand should indicate 50.

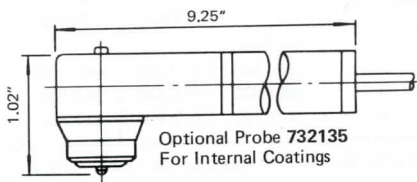
Now the unit is ready for high range measuring operation.

For low range operation, place 50 Micron mm film sheet on the metal piece and adjust the hand position by using the "Zero" knob.

PROBE DIMENSIONS:



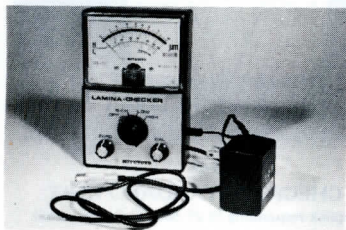
Standard Probe



Optional Probe 732135
For Internal Coatings

**AC ADAPTER 732119**

AC Adapter, shown below, is an optional accessory to Lamina Checker. This adapter is for a continuous use on assembly line.



The graduations on the Lamina Checker are proportioned to permit more exacting readings in the high range. Here are the details.

Furnished Accessories:

- Standard base metal for zero-setting (steel or aluminum plate) 50x50x1mm.
- Calibration films — 25, 50, 100, 250 microns M.
- Fitted carrying case.
- 006p, 9V battery and operation manual.

SELECTION GUIDE

No.	Substrate	Coating	
179-710 179-711 179-712	Magnetic	Aluminum Brass Cadmium Cromium Copper	Gold Lead Silver Tin Zinc
179-731	Non-magnetic	Oxide Plastic, Glass, etc.	Paint Rubber

GRADUATION

No.	Range	Graduation	Note
179-710	0 — .0004" .0004 — .002"	.00002" .00005"	High Range
179-711	0 — .0005" .0005 — .002" .002 — .004" .002 — .005" .005 — .010" .010 — .020"	.00005" .0001" .0002" .0002" .0005" .001"	High Range Low Range
179-731	0 — .004" 0 — .004" .004 — .020"	.0001" .0002" .0005"	High Range Low Range

No.	Range	Accuracy	Coatings
179-710	0 — .002" High Range Only 0 — 0.05mm High Range only	$\pm .00004"$ up to .0008" $\pm 5\%$ of reading beyond .0008"	Non-magnetic coatings on magnetic substrates
179-711	0 — .004" Z .002 — .020" (0.05 — 0.5mm) Low Range	$\pm .0006"$ up to .0012" $\pm 5\%$ of reading beyond .0012"	
179-712	0 — .025" (0 — 0.6mm) High Range .020 — .075" (0.05 — 2mm) Low Range	$\pm .0001"$ or $\pm 5\%$ of reading	
179-731	0 — .004" (0 — 0.1mm) High Range 0 — .020" (0 — 0.5mm) Low Range	$\pm 3\%$ of full scale	Non-conductive coatings on non-magnetic substrates

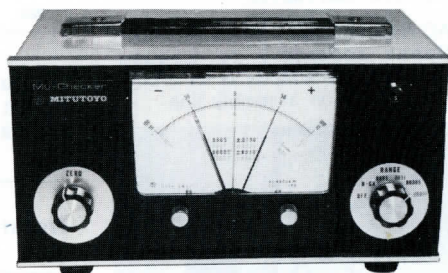
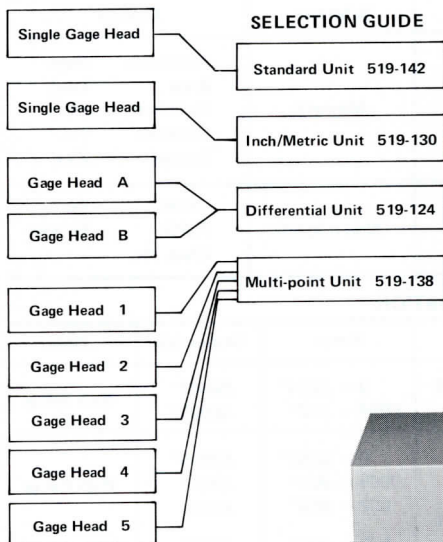
Measurable Curvature:

179-710, 711, 712

179-731

Over .118"DIA. convex, over 1" concave to flat.

Over .270"DIA. convex, over 1" concave to flat.



519-142

MU-CHECKER STANDARD UNIT

Features quick-responding (0.25 Sec.) indicating hand.

Optional re-chargeable
nickel-cadmium battery
100541

Recorder 178-701 can be connected

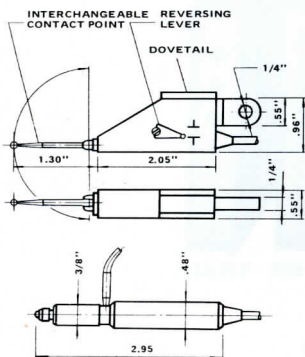
MU-CHECKERS Series 519

The MITUTOYO Mu-Checker is a solid-state, fully-transistorized electronic instrument for ultra-precise measurements. The smallest division is 10 millionths, when the highest range is selected, or 5 millionths with the Metric/Inch model.

It features high quality transistors, plug-in printed-circuit boards and the latest in electronic developments available today. Where an electrical power source is unavailable, an optional Nickel-Cadmium battery can be

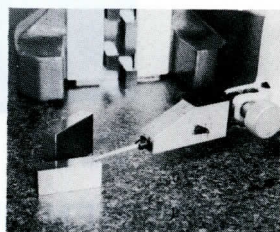
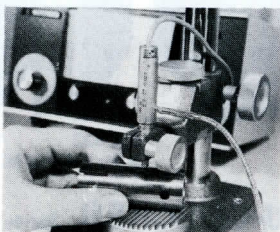
substituted. The battery offers more than seven hours of continuous and stable operation before recharging. All operate on either 100, 117, 200 or 230VAC with $\pm 10\%$ power variations.

- Repeatability less than .000004".
- Accuracy to less than 2% of full scale.
- Stability to less than 1% of full scale.
- Zeroing range .002".
- Indicating hand on the scale is extremely quick to respond (0.25 sec.).

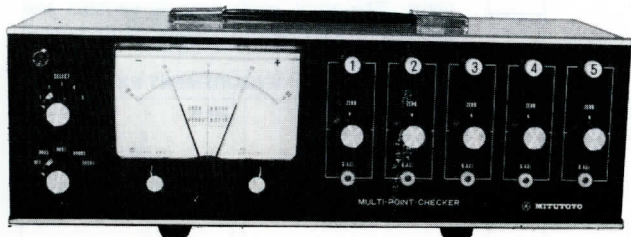


Cartridge Head 519-107

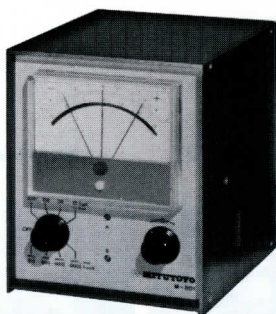
Lever Head 519-106



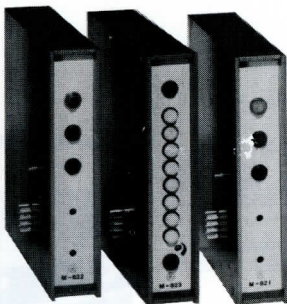
Model	No.	Range and Smallest Division			
STANDARD UNIT	519-142	Range Division	$\pm .01''$.0005"	$\pm .002''$.0001"	$\pm .001''$.000050"
DIFFERENTIAL UNIT	519-124	Range Division	$\pm .01''$.0005"	$\pm .002''$.0001"	$\pm .001''$.000050"
INCH/METRIC UNIT	519-130	Range Division	$\pm .01''$.0005"	$\pm .003''$.0001"	$\pm .0003''$.000010"
		Range Division	$\pm 300 \mu$ 10.0 μ	$\pm 100 \mu$ 5.0 μ	$\pm 30 \mu$ 1 μ
MULTI-POINT UNIT	519-138	Range Division	$\pm .01''$.0005"	$\pm .002''$.0001"	$\pm .001''$.000050"
GAGE HEAD	No.	Description			
LEVER HEAD	519-106	Diameter of contact point .078" DIA. Can be interchanged with .039" DIA. and .118" DIA. points. Contact pressure 20 - 30 grams. Total point travel .030".			
CARTRIDGE HEAD	519-107	5/32" DIA. hardened steel ball point. Can be interchanged with all AGD points. Contact pressure 20 - 30 grams. Total point travel .055".			

MULTI-POINT
MU-CHECKER

519-138



519-801
MAIN UNIT



519-822 519-823 519-821
ADD-ON UNITS

M-800 SYSTEM NU-CHECKER Series 519

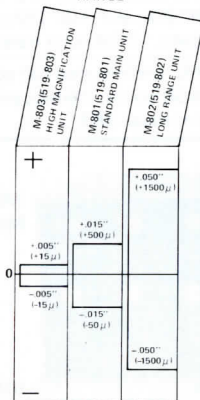
MAIN UNITS

Among the three main units offered from MITUTOYO, the No. 519-801 shown above is the general purpose amplifier, offering the most widely used ranges and graduations. This general purpose unit takes lever head No. 519-841 and/or cartridge head No. 519-831.

The Main unit No. 519-802 is for a long range gaging applications. Most competitive units do not offer the range of this magnitude. The longest range provided by this unit is $\pm 0.050''$ (± 1500 microns), which is several times greater than the most available electronic comparators of this type. Cartridge head No. 519-833 is used for this main unit.

The main unit No. 519-803 is a short range, high-magnification unit. The smallest graduation on the highest scale is 1 millionth of an inch (0.05 micron). If ultra-precision gaging is your major concern, this unit is the answer. The unit offer 5 inch and 5 metric ranges. No. 519-801 and 802 main units are featured with 4 inch and 4 metric ranges. All of them are differential gaging units.

MAXIMUM MEASURING
RANGE



ADD-ON UNITS

No. 519-821

Go, No-Go light unit. A band of tolerance is indicated by Over(amber), OK(green) or Under(red). The upper and lower limits are individually set by the set screw on the front panel.

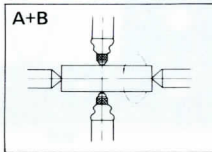
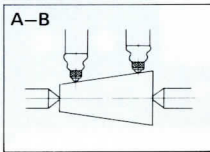
No. 519-822

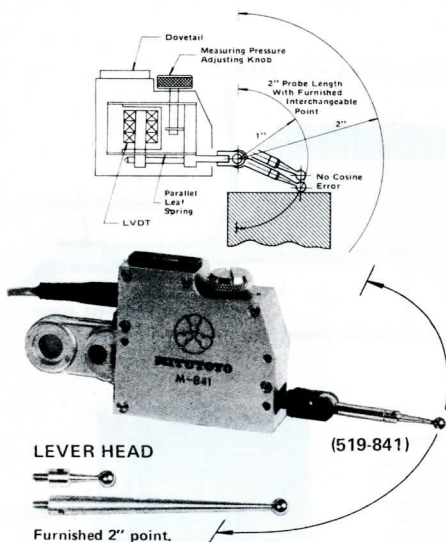
Runout unit. The unit will warn if a runout of concentricity tolerance has been exceeded irrespective of basic dimensional changes. Front panel from top, the unit comes with a push button, red warning light, green light, tolerance setting screw and timer set screw. If the dimension between the lowest and highest gage reading exceeds a preset value within a preset period, the visual indicator lights will change from green to red.

No. 519-823

Grading unit. For size classification of piece parts. Display 4 plus grades and 4 minus grades, each one of them evenly spread. Upper and lower limits are indicated by red lights. The total grade span is variable and selected at any desired range. With output relay connector.

DIFFERENTIAL MEASUREMENT EXAMPLES



**Main Unit Specifications****519-801 (M-801) Standard Main Unit**

Inch		Metric	
Range	Graduation	Range	Graduation
$\pm .0005''$	.00001"	$\pm 15\mu$	0.5 μ
$\pm .0015''$	.00005"	$\pm 50\mu$	1 μ
$\pm .005''$	.0001"	$\pm 150\mu$	10 μ
$\pm .015''$	.0005"	$\pm 500\mu$	10 μ

519-802 (M-802) Long Range Unit

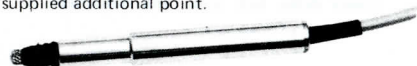
Inch		Metric	
Range	Graduation	Range	Graduation
$\pm .0015''$	.00005"	$\pm 50\mu$	1 μ
$\pm .005''$	.0001"	$\pm 150\mu$	5 μ
$\pm .015''$	.0005"	$\pm 500\mu$	10 μ
$\pm .050''$	.001"	$\pm 1500\mu$	50 μ

519-803 (M-803) High Magnification Unit

Inch		Metric	
Range	Graduation	Range	Graduation
$\pm .00005''$	.000001"	$\pm 1.5\mu$	0.05 μ
$\pm .00015''$	.000005"	$\pm 5\mu$	0.1 μ
$\pm .0005''$	.00001"	$\pm 15\mu$	0.5 μ
$\pm .001''$	.00005"	$\pm 50\mu$	1 μ
$\pm .005''$	.0001"	$\pm 150\mu$	5 μ

GAGE HEADS

The M-841 (519-841) lever head is for M-801 and M-803 main units, and is highly recommended for general measuring purposes. As the above illustration indicates, the contact point is suspended by a pair of parallel leaf springs and reaches maximum 2" with a supplied additional point.

**Gage Head Specifications**

	Range	Pressure	Remarks
519-831(M-831)	$\pm .020''$	50-75g	for M-801 & M-803
519-833(M-833)	$\pm .050''$	50-75g	for M-802 unit
519-840(M-840)	$\pm .003''$	3-7g	for M-803 & M-801
519-841(M-841)	$\pm .020''$	$\pm 20g$ variable	for M-801 & M-803

M-833 (519-833) Cartridge type gage head for M-802 (extra-long range) main unit. Stem dia. 3/8" and 8mm step. Must only be used with M-802 main unit. Total range $\pm .050''$. Splash and dust proof. Contact pressure 50-75g.



M-840 (519-840) For M-803 (high-magnification) main unit. The probe is supported by spring diagrams which act as frictionless bearing, and supply the force necessary to keep the stylus in contact with the work-piece. Designed for exceptional repeatability, low contact force and high sensitivity. Total range $\pm .003''$. Contact pressure 3-7g.

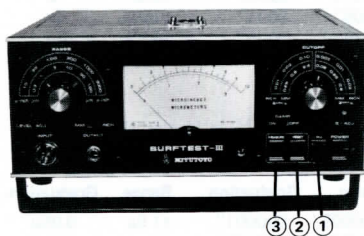
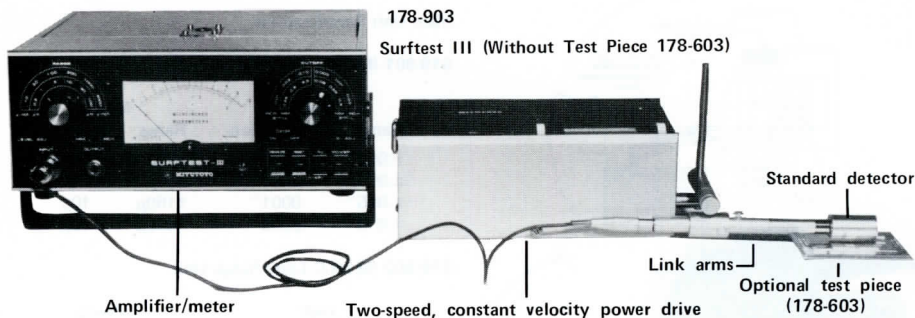


M-831 (519-831) For standard M-801 main unit. Splash and dust proof. 3/8" dia. cartridge head Total range $\pm .020''$. Contact pressure 50-70g.

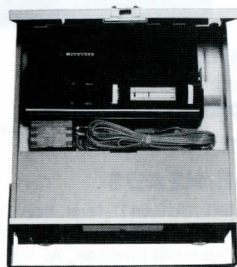
Add-On Unit Specifications

519-821 (M-821)	GO, NO-GO Light Unit
519-822 (M-822)	Roundout Unit
519-823 (M-823)	Grading Unit

For further information, request bulletin #730 M-800 Mu-Checker.



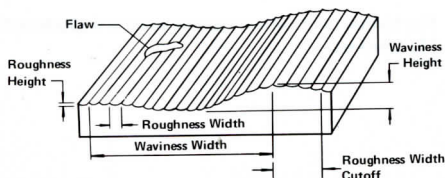
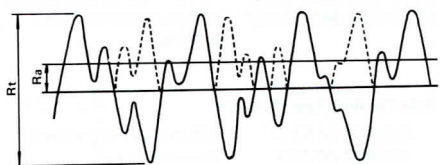
All control switches are located on the front panel. Ra(AA) reading is indicated continuously on the meter. Rt reading is indicated only when "measure" switch is depressed. To bring back the indicating hand on Rt, depress "reset" switch.



The amplifier/meter unit has storage area for power drive, link arms, and detectors.

SURF TEST III Series 178

Ra (AA) AND Rt SURFACE ROUGHNESS HEIGHTS

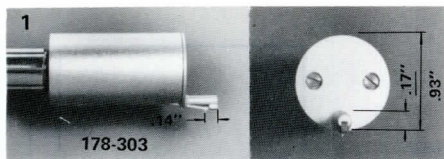


MITUTOYO Surftest III is features with two roughness reading systems. One is the Ra reading Arithmetical Average (AA), which is the average deviation of a mean line through the texture, and the other is the Rt reading, which is the maximum height between the peak and valley of the traced surface.

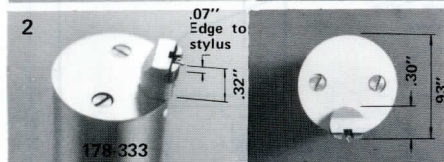
The illustration shown here will clarify the difference between the Ra and Rt readings.

If you need further information on the Ra(AA) reading, obtain ASA B46 specifications originally published by the American Standard Association (now re-organized under American National Standard Institute). Note that the RMS value occasionally used is an old reading method, and the Ra(AA) is the currently used roughness reading designation.

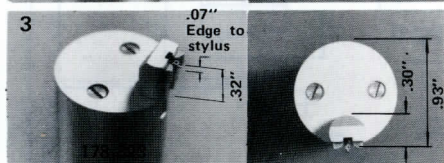
The Rt reading featured by the Surftest III is a DIN and JIS oriented specification, and is not standardized yet in the United States. However, the Rt reading offers valuable information to the inspectors since it reveals some of the surface characteristics left undetected by the Ra(AA) reading.



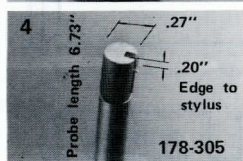
178-303



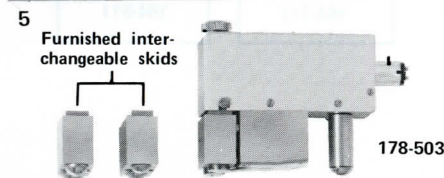
178-333



178-305

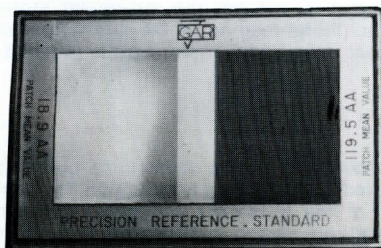


178-305



178-503

1. Standard detector furnished with the Surftest III
2. Skid replaced by the inside skid mount
3. Skid replaced by the outside skid mount
4. Detector for small holes
5. Hand tracer



178-603 TEST ROUGHNESS SPECIMEN

Surftest III No. 178-903

Inch		Metric	
Range	Division	Range	Division
0-10	0.5	0-0.3	0.02
0-30	2	0-1.0	0.05
0-100	5	0-3.0	0.2
0-300	20	0-10	0.5
0-1000	50	0-30	2
0-3000	200	0-100	5
(In microinches)		(in microns)	

Tracing speed 6mm/sec. and 2mm/sec.

Power drive maximum length 2"
(continuously adjustable)

Probe Standard tracing probe
No. 178-303 furnished.

Power requirement:
100, 117, 200 or 220VAC 50/60Hz.

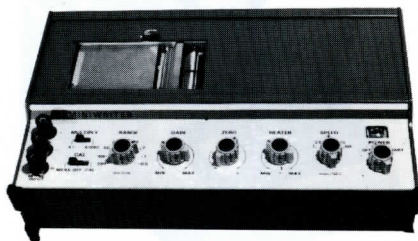
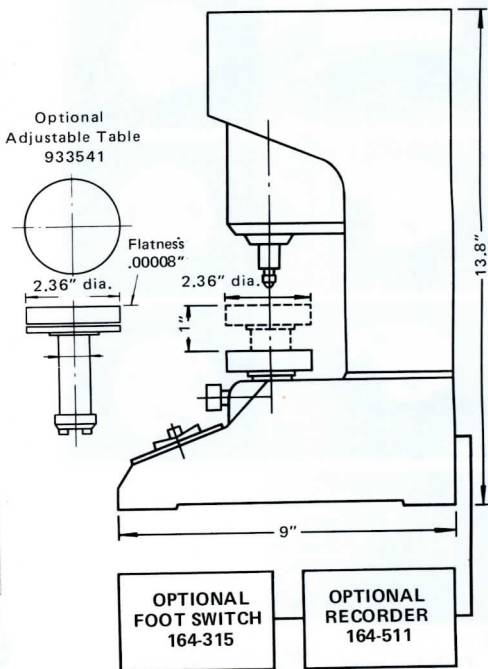

SURFCORDER 178-701

Chart size: 50mm x 40mm, Chart speed: 30mm/sec. 60mm/sec. Recording width: ± 20 mm. Range: 2V/cm, 1V/cm, 0.5V/cm. Input system: floating system. Maximum sensitivity: 10mV/cm. Linearity: $\pm 2\%$ of full scale. Line power: 100, 110, 200, 220, 230, 240VAC 50/60Hz. The surfecorder 178-701 can be used for Surftest 111, as well as the Mu-Checkers.

No.	Description
178-303	Standard detector
178-305	Detector for small holes (optional)
178-323	Outside skid mount (optional)
178-333	Inside skid mount (optional)
178-503	Hand tracer (optional)
178-603	Test piece, traceable (optional)
178-701	Surfecorder
178-903	Surftest 111



318-102



ELECONT MICROMETER Series 318

MITUTOYO's new ELECONT MICROMETER is an electronic measuring instrument with a unique probe design that assures a consistently uniform and light measuring pressure. The precise control of the measuring pressure recommends the ELECONT MICROMETER for measuring compressive materials; such as rubber, teflon and plastics; as well as hard metallics, and, results in highly-accurate, comparable measurements.

The ELECONT MICROMETER features a self-propelled measuring probe which descends and ascends at a constant velocity of 2mm per second and has a measuring pressure of only 30gf (0.294N). The instant

the probe touches the workface, which must be conductive, the circuit controlling its movement is opened, the movement stops and the digital reading of the dimension on the front panel of the instrument is retained.

The movement of the measuring probe is activated by depressing a switch on the front panel of the ELECONT MICROMETER. An optional foot switch, part number 164-315 is available, should it be necessary to free the hands for holding specimens.



ABSOLUTE AND COMPARATIVE MEASUREMENT BY ELECONT MICROMETER

The vertical measuring probe is directly connected to the inch/metric disc encoder which scans the physical dimensions to .0001"/0.001mm resolution. The reading on the digital display can be zeroed at any point and it can also be preset to 1" or 30mm by the preset button. Because of these features, the ELECONT MICROMETER is capable of performing two measuring functions:

A. Absolute measurements.

Set ELECONT MICROMETER to indicate zero when probe touches the table surface. Now, ELECONT performs like a high-precision, super micrometer.

B. Comparative measurements.

Zero set the ELECONT to a masterpiece or gage block first. Dimensional deviations from master will be indicated to plus or minus .0001"/0.001mm resolution on the display.

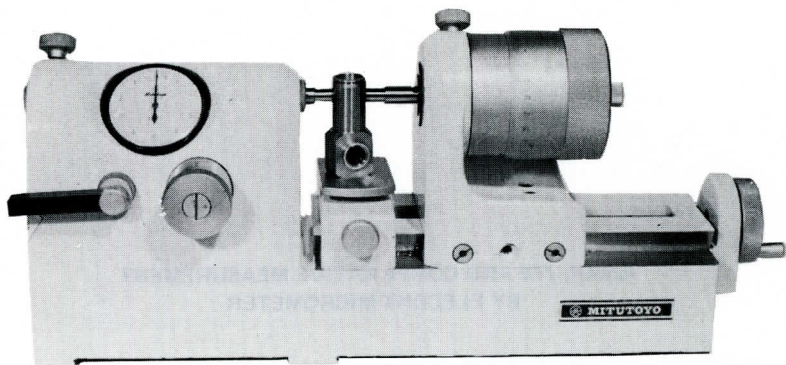
APPLICATION EXAMPLES

Measure compressive materials such as:

1. Rubber-based components, used in copy and word-processing machines.
2. Teflon-based parts-assemblies which cannot be inspected by a profile projector, because they simply absorb light and project poor image on the screen.
3. Insulating materials having resilient properties.
4. O-rings, compressive belts, etc. for diameters or thicknesses.
5. Films, Mylars and other compressive sheets.

Specifications:	Indicating Accuracy:	$\pm .00015''$
	Repeatability:	$\pm .0001''$ (± 2 sigma)
	Measuring Pressure:	30gf (0.294N)
	Digital Display:	With ZERO set and PRESET (1" or 30mm) BCD output (serial)
	Line Power:	100, 117, 200, 220VAC.
Optional Items:	164-511	One-axis Printer (Roll paper No. 731098)
	164-315	Foot Switch for probe control.
	933541	Parallelism adjustable Table, supplied with 5mm gage block and wrench.

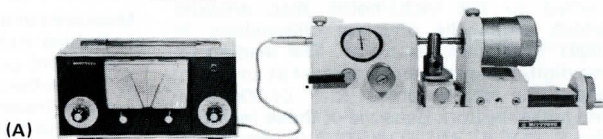
Range	No.	Resolution	Spindle Stroke	Table Adjustment
2"/50mm	318-102	.0001"/0.001mm	1"/25mm	1"/25mm



162-102

BENCH COMPARATOR

Series 162

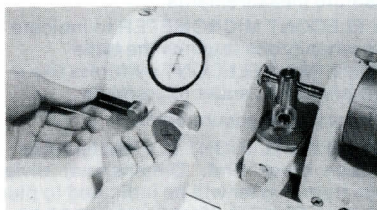


Mu-Checker 519-142, Cartridgehead 519-107, Bench Comparator 162-102

The MITUTOYO Bench Comparator is an excellent calibration equipment for quality-control departments where tolerances to millionths are encountered. It is highly recommended for comparative gaging using a "master" or a gage block for reference, because of its variable-pressure, retractable anvil and tenths-reading dial indicator. When an electronic amplifier, such as the MITUTOYO Mu-Checker photo (A) is incorporated with the Bench Comparator for a gaging operation, the combined unit measures to 5 millionths on the Mu-Checker scale. The total range of the Comparator is 4".

The measuring pressures of the spring-loaded anvil may be varied, over a range of 0.5 to 3 lbs., by means of a special regulating knob photo(B). Once set, the pressure remains constant and assures accurate comparative-gaging. The anvil is retracted by depressing the lever.

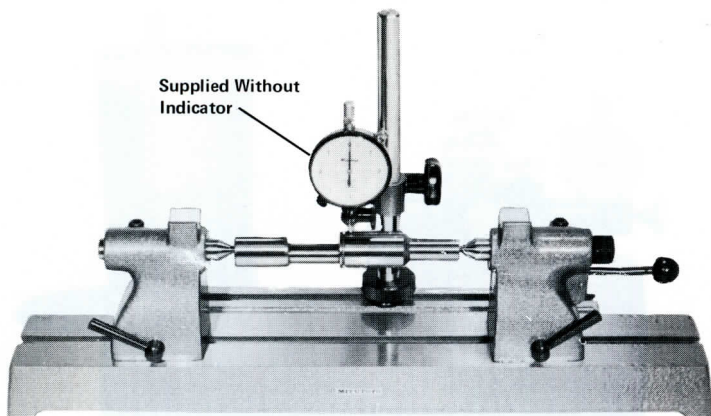
The extra-large-thimble micrometer, with a range of 1", reads directly in .0001", as does the dial indicator on the anvil side of the Comparator. Both the spindle and anvil are carbide tipped to insure long-lasting original-accuracy.



(B)

- Overall range 0—4", for OD measurements.
- The variable anvil pressures are 0.5, 1, 1.5, 2, 2.5 and 3 lbs.
- Dial Indicator is shock proof.
- Adjustable work-table size: 1-9/16 x 2-3/4".
Vertical adjustment: 1-9/16".
- 1" and 2" MITUTOYO Gage Blocks are furnished with the Bench Comparator.
- Supplied with case.

No.	Range		Graduation		Variable Pressure
	Overall	Micrometer Head	Micrometer Head	Dial Indicator	
162-102	0 - 4"	0 - 1"	.0001"	.0001" (0-5-0)	0.5, 1, 1.5, 2, 2.5, 3 lbs.



915-102

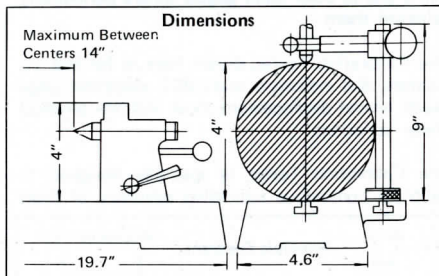
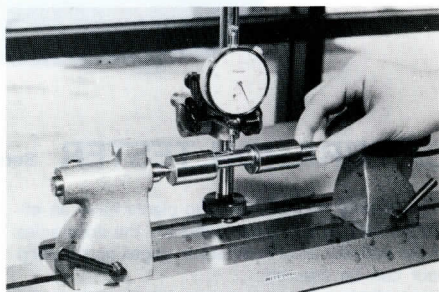
BENCH CENTER

No. 915-102 for accurate concentricity checks.

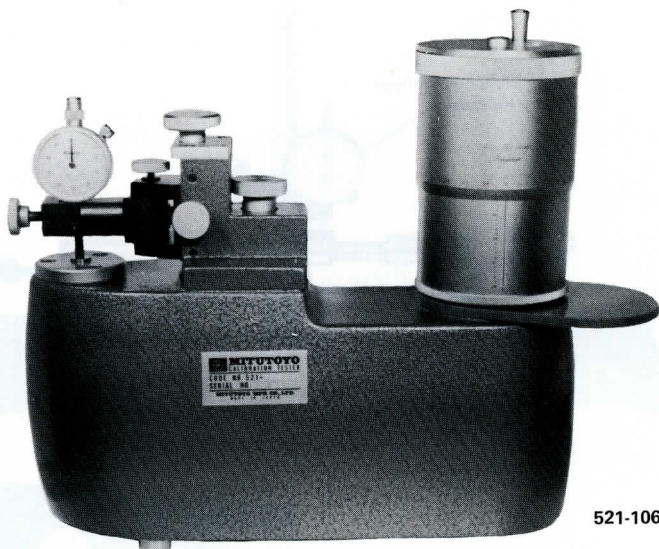
The MITUTOYO Bench Center No. 915-102 is a ruggedly constructed precision center for checking run-out, concentricity of shafts and other cylindrical workpieces. The upright post is designed to accept all AGD type indicators with 3/8" DIA. stem.

The holding capacity is 14" in length and 4" in diameter. The bench center is made of a seasoned cast iron, and has a finely ground precision surface with T-slots. A pair of 90 degree Vees is located atop the center for holding odd, centerless pieces. The lever on the right-hand center-head is for retracting and dismounting workpieces.

After the concentricity is checked with a "tenths" reading dial indicator, the height of cam is measured with thousandths reading, 0-.500" range, indicator No. 2414



	Capacity		Remarks
	Diameter	Length	
Bench Center	4"	14"	Accepts all AGD type indicators and probes with 3/8" DIA. stem



521-106

CALIBRATION TESTER Series 521

The majority of metalworking plants have an effective calibration system whereby the accuracies of the actively used comparison gages on the shop floor can be assured. Some plants color code gages, others periodically calibrate them.

The Calibration Tester, shown here, is for test indicators, dial indicators and LVDT electronic gage heads whose displacement must indicate physical linear variations.

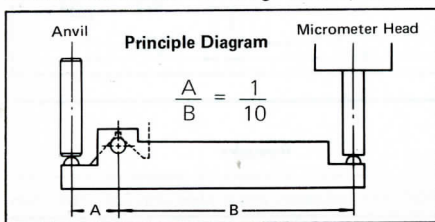
The Calibration Tester is specially designed to calibrate continuous indicating accuracy of short

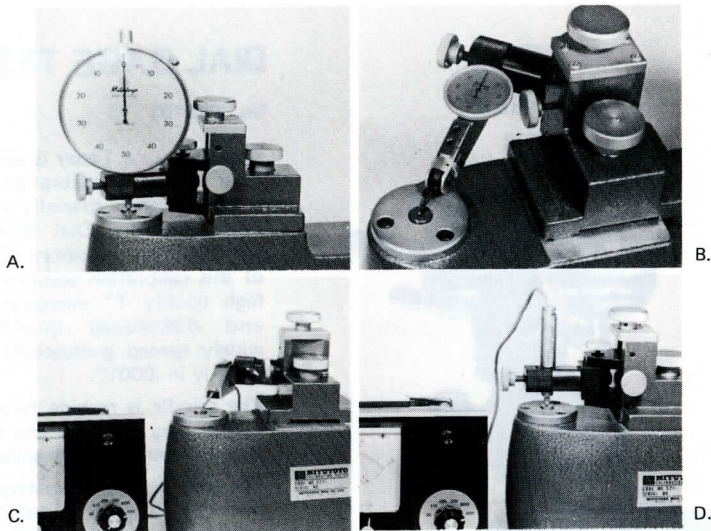
range dial indicators, test indicators and other electronic comparison gage heads. As the diagram shown on this page indicates, the Calibration Tester employs a horizontal beam which is pivoted at 1 to 10 length ratio. Thus, a single turn of the micrometer head creates one tenth of the actual dimension at the anvil end. In this case, one complete rotation of the head makes the beam move .025". However, at the anvil top, this dimension will be converted to .0025".

The graduations on the micrometer head indicate not actual head dimensions, but 10 times finer values which is the value of the anvil movements. The smallest graduation on the micrometer thimble is, therefore, 10 millionths (.000010") for inch model and 0.0002mm for metric equivalent.

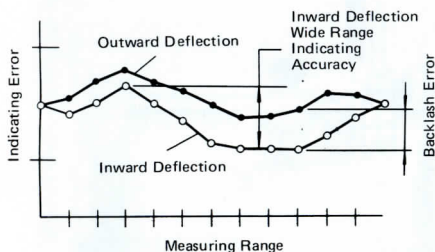
The universal clamp securely holds all MITUTOYO comparison gages and most others in the market.

If over a dozen or two indicators are used in the plant, the Calibration Tester is a necessary equipment to check their indicating accuracies.





The chart below is an example of plotting dial indicator's indicating accuracy as checked by the Calibration Tester. Note inward and outward deflections. For accuracy specifications, see AGD., MIL. and ANSI Specifications. Some of the highlights are shown in this catalog under Dial Indicators.



Application Examples

- A. Continuous indicating accuracy of Series 4 dial indicator is under observation. Wear in the gear train is best detected by the Calibration Tester.
- B. Test indicator under calibration. Note, holder can be turned around to clamp indicator securely in position.
- C. MITUTOYO Mu-Checker's Lever Head is featured with a LVDT-type transducer. The probe movement is calibrated by the tester. By this setting method, "Gain" control can be adjusted.
- D. Cartridge Head is also calibrated to 10 millionths accuracy with the Calibration Tester.

	No.	Range	Graduation	Indicating Accuracy	Remarks
Inch	521-104	.050"	.00001"	$\pm .00001"$	* Stem holding capacity .157 — .394"DIA. * Dual-directional graduations
	521-106	.200"	.00001"	$\pm .00003"$	
Metric	521-103	1mm	0.0002mm	$\pm 0.0002\text{mm}$	* Supplied with fitted carrying case
	521-105	5mm	0.0002mm	$\pm 0.0008\text{mm}$	

**170-101**

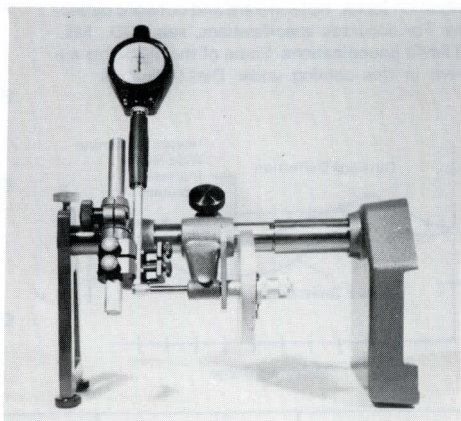
DIAL GAGE TESTER

No. 170-101

The Dial Gage Tester is one of the most efficient calibration instruments designed specially to check Dial Indicators, Dial Bore Gages and Dial Test Indicators. The heart of this calibration equipment is its high quality 1" micrometer head and disk-shaped thimble with widely spaced graduations reading directly in .0001".

The spindle is carbide faced to assure a long tool life and uniform flatness over the entire spindle face.

The thimble, approximately 4.3" in diameter, is most suited for this application. Heavy cast iron base is incorporated to achieve greater rigidity.



Optional Stand **951498** allows Dial Gage Tester to hold bore gages in upright position, as shown above, and calibrate them to .0001".

	Range	No.	Graduation
Inch	0-1"	170-101 with Holder attachment	.0001"
Metric	0-25mm	170-102 with Holder attachment	.001mm



COMPARATOR STAND NO. 215-201

Extremely rigid comparator stand for precise comparative measurements. AGD type dial indicators with 3/8" dia. stem and MITUTOYO cartridge head (519-107) readily fit into this stand. A bracket for indicators with 1.1" dia. stem is also available. (990014).

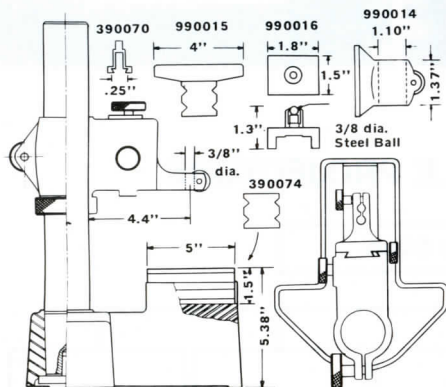
The stand takes workpieces up to 8" in height and has a useful fine adjusting knob.

The photographed stand is equipped with 4" wide optional serrated anvil (990015).

Standard anvil furnished is a serrated anvil 1.6" wide and 5" deep (390074). 3/8" dia. steel ball anvil is also available.

ACCESSORIES:

No.	Description
390070	Dovetail attachment
390074	Furnished standard serrated anvil.
990014	Bracket for 1.1" dia. stem indicators.
990015	4" wide serrated anvil.
990016	3/8" dia. steel ball anvil.



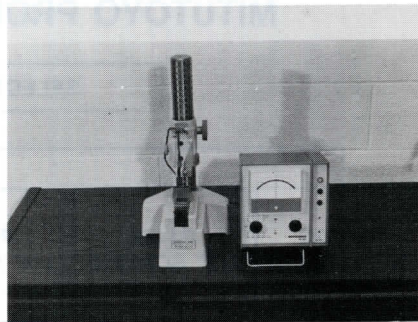
390074



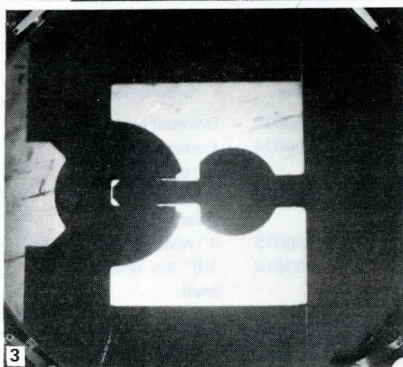
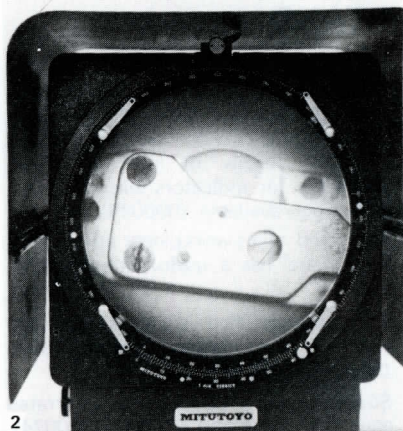
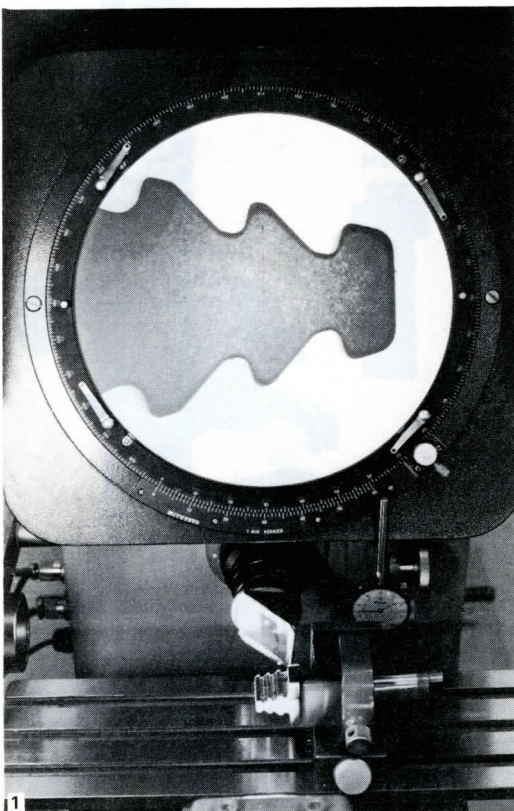
215-201



MEASURING APPLICATION
WITH M-800 MU-CHECKER



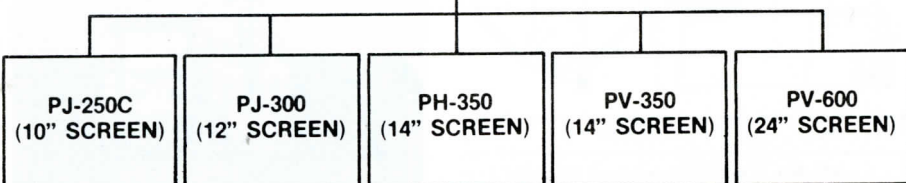
No.	Description
215-201	with Serrated Anvil (390074)



1. PH-350 2. PJ-250C 3. PJ-300

MITUTOYO PROFILE PROJECTORS

SELECTION GUIDE





SELECTION GUIDE

PJ-250C Series 301

The 10" screen compact Mitutoyo projector offers the brightest screen image in its class and wide inspection capabilities.

The PJ-250C is used as a workhorse in the calibration/Q.C. department as well as on the shop floor.

The standard unit is a complete working model and rarely requires additional accessories.

PJ-300 Series 302

The PJ-300 model with 12" screen features a built-in surface illuminator located in its main housing. This particular construction allows more work area and clearance to adapt larger microstages.

You may adapt 2x2", 2x4" or 2x6" travel microstages depending upon your inspection requirements.

Because of the extremely bright light source, 100X magnification lens is made available.

PH-350 Series 172

The horizontal beam 14" screen projector PH-350 is highly recommended for checking large machined products.

6" travel microstage has 16"x6" table dimensions and is a part of the standard package No. 172-944.

All stages accept additional work holding devices such as center stage, riser, V-block, etc. See this catalog for further details.

PV-350 Series 172

The vertical beam 14" projector PV-350 is often specified by the manufacturers of small aircraft parts, computer parts, metal and plastic parts and other manufacturers whose products are relatively light.

PV-350 and PH-350 offer 5X lens which produces the largest field of view among 5 available models.

A great projector for manufacturers who specialize in small parts.

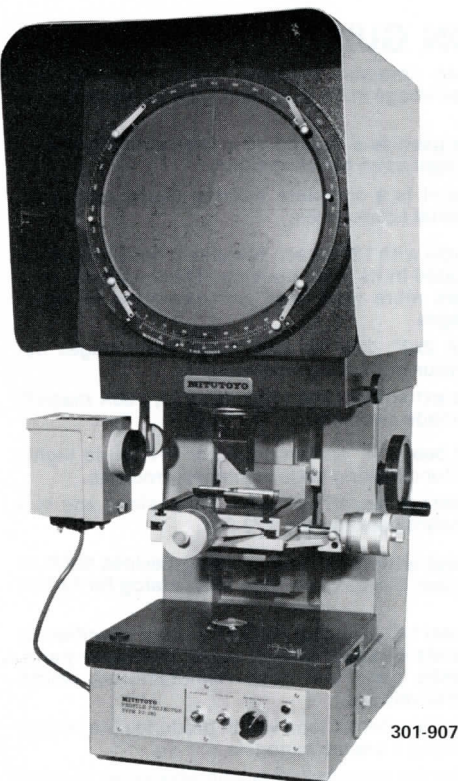
PV-600 Series 305

The largest projector of the group. The PV-600 offers 10X, 20X, 50X, and 100X magnifications. Because of the large screen size, much wider area can be inspected at a glance.

2x2" or 2x4" travel microstage is available.

Highly recommended for general inspection purposes.

Profile Projector Screen Size Optical Axis Protractor Screen	PJ-250C 10" Vertical 1 minute	PJ-300 12" Vertical 1 minute	PH-350 14" Horizontal 1 minute	PV-350 14" Vertical 1 minute	PV-600 24" Vertical 1 minute
Magnifications	10X 20X 50X	10X 20X 50X 100X	5X 10X 20X 50X	5X 10X 20X 50X	10X 20X 50X 100X
Stage Travel	2x2"	2x2, 2x4, 2x6"	6"	1x1, 2x2"	2x2, 2x4"



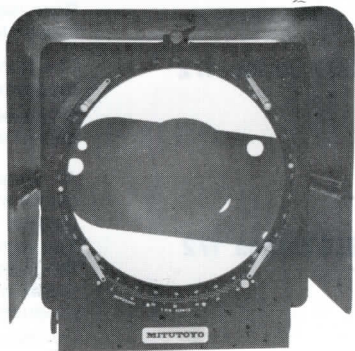
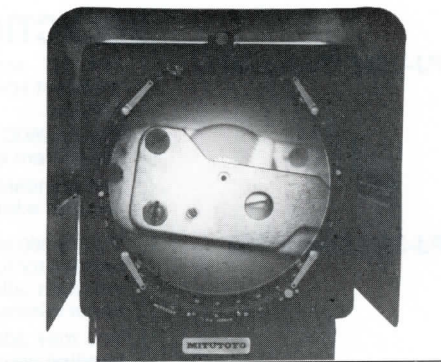
301-907

PROFILE PROJECTOR

PJ-250C, Series 301, 10" Screen

The PJ-250C model, with 10" screen, is the smallest profile projector offered by MITUTOYO. Despite its compact size and modest cost, the PJ-250C provides bright, sharp images and features specifications comparable to more costly projectors. Recently, the brightness of the screen was increased significantly, and, it can be adjusted high or low by the switch located on the front panel. The PJ-250C is furnished with built-in condenser lenses for 10X, 20X and 50X magnifications.

The standard unit shown above, No. 301-907, is a complete working unit for general inspection purposes and requires few additional accessories. It is available in two ways; with a protractor screen, or, a plain screen. Both models consist of the following 5 components:



Contour, surface or contour/surface illumination with high-low intensity.

- (1) Basic unit, (2) Screen of your choice—protractor or plain, (3) 10X magnification lens set, (4) 2x2", .0001" graduation microstage and (5) Surface illuminator.

FEATURES

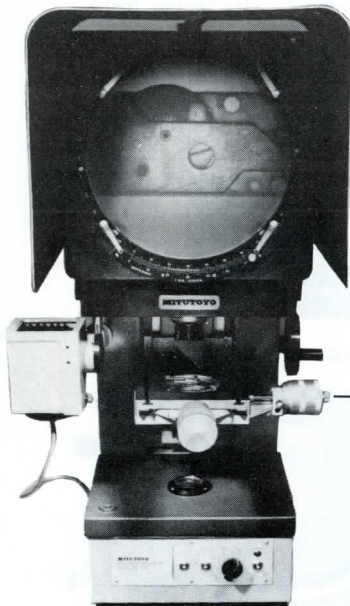
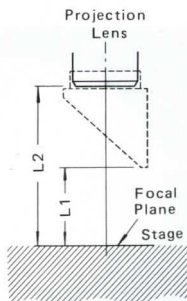
- 10X, 20X and 50X magnifications.
- Bright, sharp images on 10" screen with crossed hair line.
- Built-in condenser lenses for 10X, 20X and 50X magnifications.
- High-low contour illumination intensity.
- Long list of accessories to aid measurements and inspection.



LENS SELECTION AND WORK CLEARANCE

Magnifications	Lens Set No.	Field of View	Work Clearance	
			L1	L2
10X	172-125	.98"	2.36"	.67"
20X	172-126	.49"	1.18"	.19"
50X	172-127	.19"	.43"	—

Note: Half-reflection Mirror is not available for 50X lens.

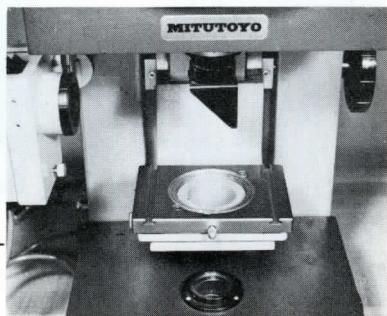


301-907

PLAIN STAGE 172-123

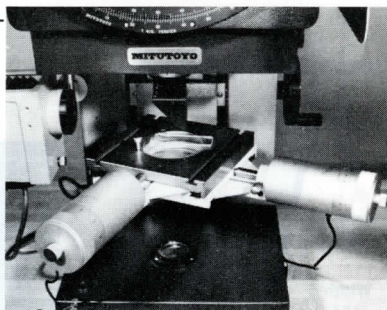
The plain stage shown here is not a part of the standard units. However, it can be selected instead of the 2 x 2" standard microstage.

Overall dimensions 5.5 x 4" Stage Glass 3.15" DIA. With T-Slots for additional fixtures.



OPTIONAL MICROMETER HEADS

The standard 2 x 2" microstage is supplied with a pair of vernier-reading regular mike heads 152-391 and 152-392. These heads can be interchanged with many other micrometer heads available from MITUTOYO. 164 Series DIGIMATIC heads are used in this particular example.



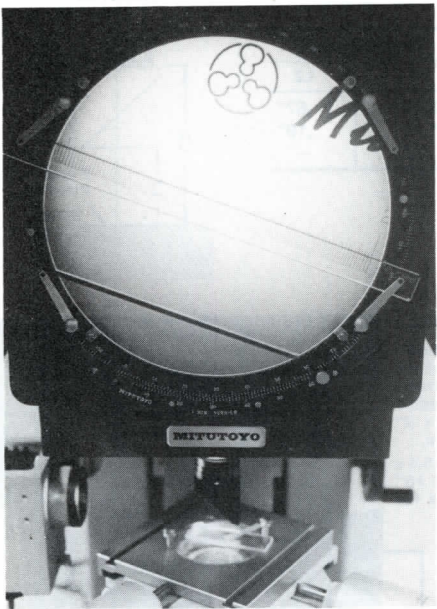
OPTIONAL SELECTION STAGE AND MICROMETER HEADS

The standard, pre-packaged units No. 301-906 and 301-907 are supplied with 2 x 2" travel .0001" reading Microstage No. 176-131. If application calls for a scanning inspection only and requires no measurements, then the Plain Screen No. 172-214 is recommended. If specifications are indicated by an inch/metric dual method or metric only, then 164 Series DIGIMATIC heads, shown above, may be your inspector's choice.

LIST OF INTERCHANGEABLE MIKE HEADS

Range	No.	Graduation	Remarks
0-1"	152-391	.0001"	Supplied with 176-131 Stage (X)
0-1"	152-392	.0001"	Supplied with 176-131 Stage (Y)
0-1"	252-392	.0002"	With double digital counter
0-2"	197-201	.0002"	Non-rotating, quick travel head
0-2"	297-201	.0002"	With digital counter

164 Series Range: 0-1", 0-2", 0-1"/0-25mm, 0-2"/0-50mm
Resolution: .00005" or .00005"/0.001mm
See 164 Series for more specifications

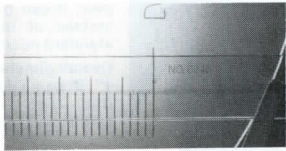


CALIBRATIONS

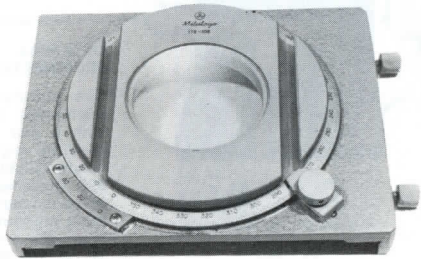
MITUTOYO offers two Glass Scales to allow users to calibrate projector's mangification accuracy.

- (1) Standard Scale 172-117
Length 2", Graduation .010"
- (2) Reading Scale 172-119
Length 8", Graduation .020"

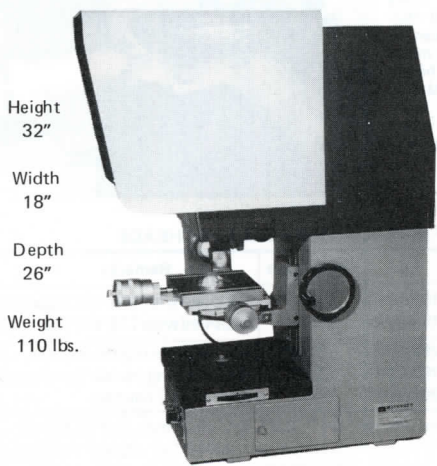
The Standard Scale is placed on the stage, and its magnified, projected image on the screen is read by the Reading Scale. Both Scales are supplied with a certificate of accuracy.



ROTARY MEASURING STAGE



DIMENSIONS & WEIGHT

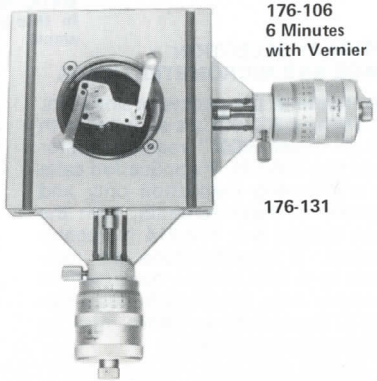


Height
32"

Width
18"

Depth
26"

Weight
110 lbs.



176-106
6 Minutes
with Vernier

176-131



PROFILE PROJECTOR

Series 301, PJ-250C (10" Screen)

LENSES

- 172-125** 10X Lens Set. Consists of 10X Projection Lens and Half-Reflection Mirror 172-169
- 172-126** 20X Lens Set. Consists of 20X Projection Lens and Half-Reflection Mirror 172-170
- 172-127** 50X Lens. 50X Projection Lens only. No Half-Reflection Mirror available for this Lens.
- 172-227** Full-Reflection (Oblique) Mirror for 10X Projection Lens
- 172-228** Full-Reflection (Oblique) Mirror for 20X Projection Lens
- 172-169** Half-Reflection Mirror for 10X Projection Lens
- 172-170** Half-Reflection Mirror for 20X Projection Lens
- 200676** Replacement Half-Reflection Mirror only for 172-169
- 200677** Replacement Half-Reflection Mirror only for 172-170

SCREENS

- 172-214** Plain Screen
- 172-211** Protractor Screen, 1 minute

SURFACE ILLUMINATOR

- 172-215** Set of Housing and Holder
172-215-1 Housing
172-215-2 Holder
- 172-215-3** Transformer

HEIGHT MEASURING ATTACHMENT

- 172-113-3** For Z-axis measurement using dial indicator

COLOR FILTER SETS

- 172-115** Set, Red and Green Filters
172-115-1 Red Filter
172-115-2 Green Filter

GLASS SCALES

- 172-117** Standard Scale .01" x 2"
- 172-119** Reading Scale .02" x 8"

STAGES

- 172-123** Plain Stage
Stage size 4 x 5.5"
Stage glass 3.15" DIA.
- 176-131** Microstage
Stage size 6 x 6"
Stage travel 2 x 2"
Micrometer Head travel 1 x 1"
Micrometer graduation .0001"
- 176-106** Rotary Measuring Stage for 176-131 Microstage
- 176-105** Swivel Center Support for 176-131 Microstage
- 176-107** Hold-down clamp for 176-131 Microstage
- 200673** Replacement Stage Glass only for 176-131 Microstage
- 510154** Adapter for Stages

PARTS

- 510188** Fuse 5A
- 510153** Vinyl Dust Cover
- 930076** Power Supply Cord
- 200727** Bulb 12V, 100W

OVERLAY CHARTS

6 Inch Overlay Charts and 6 Metric Overlay Charts are available for PJ-250C. See page 264 and 265 for more information.

301-906	Standard Unit	301-907	Standard Unit
	Consists of following items		Consists of following items
	1) 301-101 Basic Unit		1) 301-101 Basic Unit
	2) 172-214 Plain Screen		2) 172-211 Protractor Screen
	3) 172-215 Surface Illuminator		3) 172-215 Surface Illuminator
	4) 172-125 10X Lens Set		4) 172-125 10X Lens Set
	5) 176-131 2 x 2" Microstage		5) 176-131 2 x 2" Microstage



PROFILE PROJECTOR

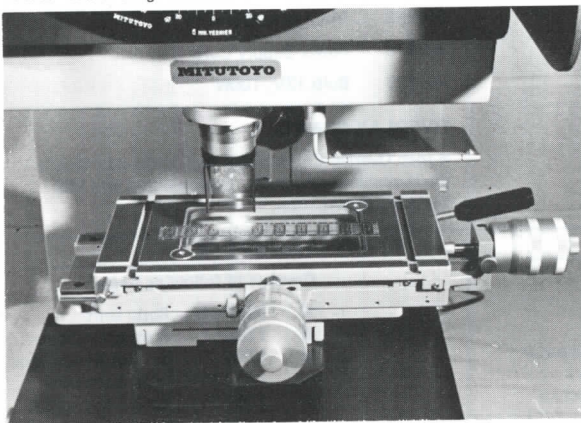
PJ-300 Series 302 (12" screen)

The 12"-screen PJ-300 Profile Projector stands out in value among MITUTOYO's five models. This medium-size, all-purpose Projector features:

1. 10X, 20X, 50X and 100X magnifications.
 2. More work area around the stages and greater clearance for specimens because of the built-in construction of the surface illuminator.
 3. Built-in condenser lens for all magnifications.
 4. Three options for microstage sizes because of the larger work area:
 - A. 2" x 2" XY travel, .0001" Microstage No. 176-131 (standard).
 - B. 2" x 4" XY travel, .0001" Microstage No. 172-218 (optional stage, shown below).
 - C. 2" x 6" XY travel, .0001" Microstage No. 172-219 (optional stage).
 5. Variable screen intensity.
 6. Three selections of illumination; contour only, surface only or surface/contour illumination.
 7. Plain Screen or 1-minute-reading protractor screen with crossed hair line.
- And more.

The PJ-300 offers the finest of projector lenses and an excellent optical system which makes it the most highly recommended optical-inspection equipment.

PJ-300 with Optional
4 x 2" Travel Stage 172-218



STAGE SELECTION

The PJ-300 features unlimited horizontal clearance. This makes it possible to use any one of the following 3 microstages, all of which are supplied with .0001" reading micrometer heads.

See the preceding Microstage pages for more information. The 2 x 2" stage, 176-131, will also be found under PJ-250C projector.

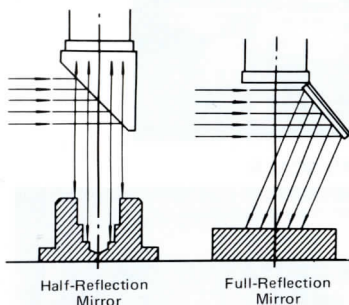
No.	Dimensions	Travel
176-131	6 x 6"	2 x 2"
172-218	6 x 11"	2 x 4"
172-219	6 x 16"	2 x 6"



LENS SELECTION AND WORK CLEARANCE

10X		20X		50X	100X
					
172-223	172-225	172-224	172-226		
172-202		172-203		172-204	172-207

HALF- AND FULL-REFLECTION (OBLIQUE) MIRRORS

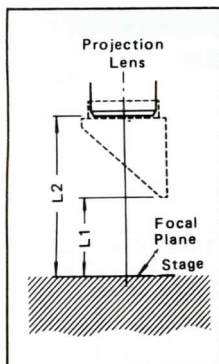


While the half-reflection mirror is a part of all of the lens sets, and is automatically supplied, the full-reflection mirror is an optional accessory for the 10X and 20X lens sets only. The reflection (oblique) mirror can illuminate flat specimens with a maximum brightness, and is recommended when checking PC boards, patterns, etc.

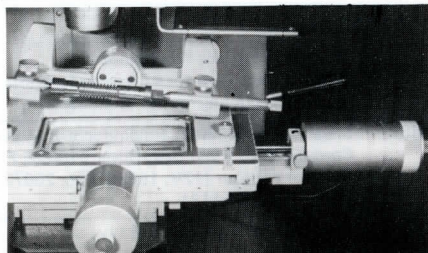
Lens Set No.	Magnif.	Full-Ref. Mirror
172-202	10X	172-229
172-203	20X	172-230



FIELD OF VIEW & WORK CLEARANCE



Magnification	Lens Set No.	Field of View	Work Clearance	
			L1	L2
10X	172-202	1.18"	.87"	2.64"
20X	172-203	.59"	.28"	1.34"
50X	172-204	.24"	.51"	.51"
100X	172-207	12"	.24"	.24"

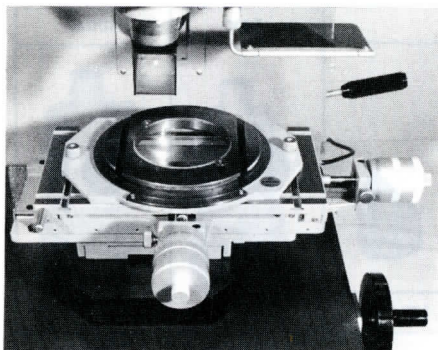


OPTIONAL MICROMETER HEADS

The standard micrometer heads Nos. 152-391 and 152-392 can be interchanged with other optional micrometer heads. Here, 164 Series heads and display are employed for Inch/Metric dual readings.

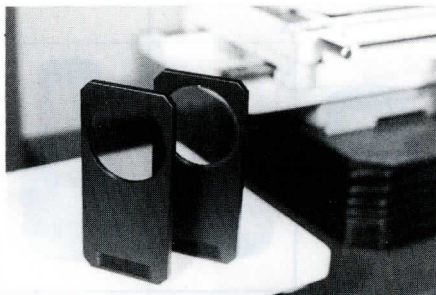


ROTARY STAGES

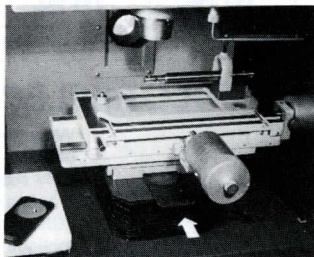


ROTARY STAGE 172-196 with 2 x 4" Travel.
MICROSTAGE 172-218

COLOR FILTERS



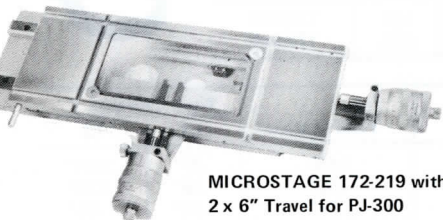
172-160
(Pair)



Rotary Stage

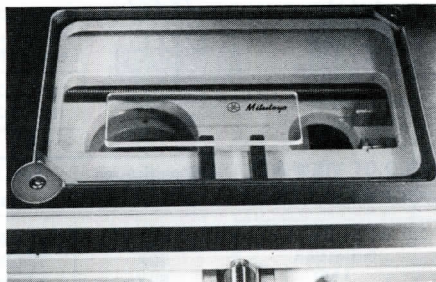
No.	Reading	Microstage
172-196	2 Minutes	172-218 (2 x 4") 172-219 (2 x 6")
178-106*	6 Minutes	176-131 (2 x 2")

* For more information on Rotary Stage
176-106, see page 246.



MICROSTAGE 172-219 with
2 x 6" Travel for PJ-300
PROFILE PROJECTOR.

STANDARD SCALE



172-117

SPECIFICATIONS Basic Unit 302-101 features:

- 1) Built-in Surface Illuminator
- 2) Condenser Lens for surface and contour illuminations
- 3) Built-in cooling fan for illuminators

Supplied with: Stage adapter 930092, holding screws (4 pcs.) 930093, Power Supply Cord 930076, Vinyl Dust Cover 510002, Fuse (5A) 2 pcs. 510188, Bulb for contour (12V, 100W) 1 pc. 200727, Bulb for surface (12V, 150W) 201131.

Dimensions: 40 x 18 x 25". Weight 178 Lbs.



PROFILE PROJECTOR Series 302, PJ-300 (12" Screen)

LENSES

- 172-202** 10X Lens Set. Consists of 10X Projection Lens 172-223 and Half-Reflection Mirror 172-225.
- 172-203** 20X Lens Set. Consists of 20X Projection Lens 172-224 and Half-Reflection Mirror 172-226.
- 172-204** 50X Projection Lens with built-in Half Reflection Mirror.
- 172-207** 100X Projection Lens with built-in Half Reflection Mirror.
- 172-208** Condenser Lens for 10X and 20X Projection Lenses Part of the Basic Unit.
- 172-209** Condenser Lens for 50X and 100X Projection Lenses Part of the Basic Unit.
- 172-229** Full-Reflection (Oblique) Mirror for 10X Projection Lens.
- 172-230** Full-Reflection (Oblique) Mirror for 20X Projection Lens.
- 172-225** Half-Reflection Mirror for 10X Projection Lens.
- 172-226** Half-Reflection Mirror for 20X Projection Lens.
- 511024** Replacement Half-Reflection Mirror only for 172-225.
- 511028** Replacement Half-Reflection Mirror only for 172-226.

SCREENS

- 172-191** Protractor Screen, 1 Minute.
- 172-217** Plain Screen.

COLOR FILTER SET

- 172-160** Set of Red and Green Filters
172-160-1 Red Filter
172-160-2 Green Filter

GLASS SCALES

- 172-117** Standard Scale .01" x 2"
- 172-119** Reading Scale .02" x 8"
- 172-162** Reading Scale .02" x 12"
- ## STAGES
- 172-216** Plain Stage. Stage size 6 x 6". Stage Glass 3.9 x 2".
- 176-131** Microstage. Stage size 6 x 6". Stage travel 2 x 2". Micrometer Head travel 1 x 1". Micrometer Head graduation .0001".
- 172-218** Microstage. Stage size 11 x 6". Stage travel 4 x 2". Micrometer Head travel 1 x 1". Micrometer Head graduation .0001".
- 172-219** Microstage. Stage size 16 x 6". Stage travel 6 x 2". Micrometer Head travel 1 x 1". Micrometer Head graduation .0001".
- 176-105** Swivel Center Support for 176-131 Microstage.
- 176-106** Rotary Measuring Stage for 176-131 6 Minutes w/vernier.
- 176-107** Hold-down Clamp for all stages with T-slots.
- 172-197** Swivel Center Support for 172-218 & 219.
- 172-210** V-Block (1") for 172-218 & 219.
- 172-196** Rotary Measuring Stage for 172-218 & 219. 2 Minutes with Vernier.

PARTS

- 200727** Bulb 12V, 100W Contour Illumination.
- 201131** Bulb 12V, 150W Surface Illumination.
- 510002** Vinyl Dust Cover.
- 510188** Fuse 5A.
- 930076** Power Supply Cord.

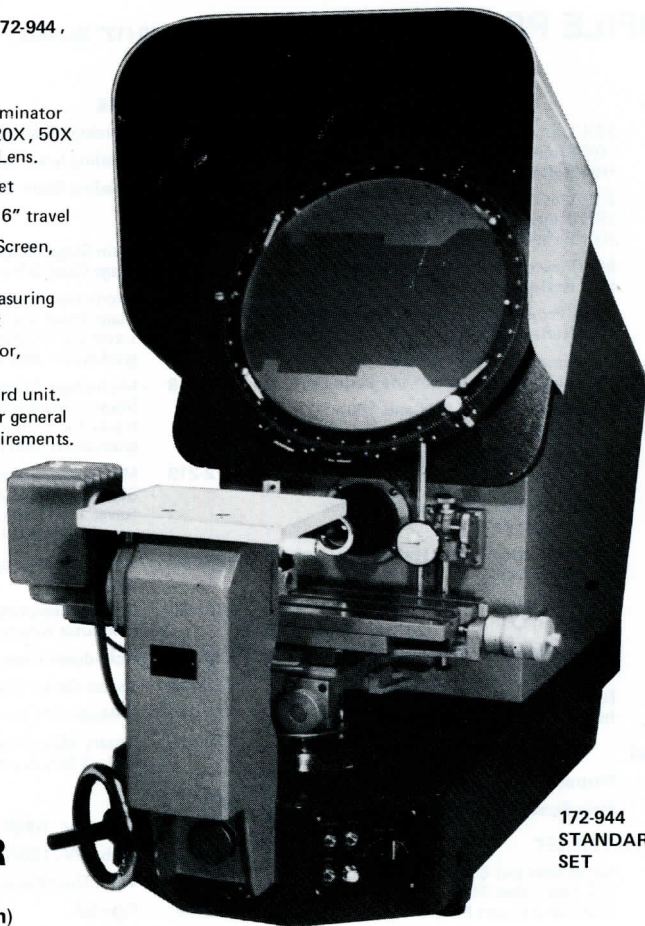
302-909	Standard Unit	302-907	Standard Unit
	Consists of following items		Consists of following items
302-101	Basic Unit with built-in Surface Illuminator and Condenser Lens	302-101	Basic Unit with built-in Surface Illuminator and Condenser Lens
172-217	Plain Screen	172-191	Protractor Screen, 1 Minute
172-202	10X Lens Set	172-202	10X Lens Set
176-131	2 x 2" Microstage	176-131	2 x 2" Microstage
172-199	Memo Table	172-199	Memo Table



The Standard Set No. 172-944, shown here, includes:

- 172-101-1 Main Unit
- 172-130 Surface Illuminator with 10X, 20X, 50X Condenser Lens.
- 172-151 10X Lens Set
- 172-137 Microstage, 6" travel
- 172-155 Protractor Screen, 1 minute.
- 172-231 Vertical Measuring Attachment
- 2424 Dial Indicator, 2" travel.

This is a working standard unit. Little else is required for general purpose inspection requirements.



172-944
STANDARD
SET

PROFILE PROJECTOR

**PH-350 Bench Model
Series 172 (14" Screen)**

The PH-350 Horizontal-Beam Profile Projector is a highly versatile, general purpose inspection equipment capable of handling various measuring requirements. Because of the Horizontal beam and rugged stages, the PH-350 can cope with difficult measuring problems with its 5X, 10X, 20X and 50X magnification lenses.

A long list of accessories and fixtures prepared for this unit adds greater value and versatility.

Both contour and surface illuminators incorporate heat-absorbing filter and fan blower to enhance longer bulb life and trouble-free operation.

Standard overlay charts and blank frosted sheets for in-house chart drawing facilitate quick inspection of complicated products. The Protractor Screen reads to 1 minute with vernier scale. A Plain Screen is also available.

**PLAIN SCREEN NO. 172-146**

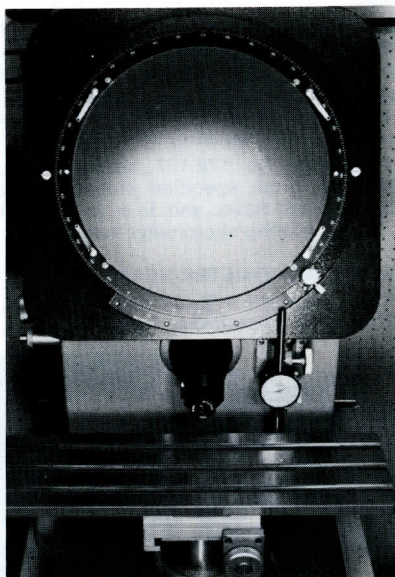
If angular measurement is seldom required, and the profile projector is intended for a limited application, then the plain screen shown here can be a wise selection.

It is featured with a finely-ground frosted-glass screen with crossed hairlines and 4 large clips to hold overlay charts. If overlays, either supplied by us or home-made by users themselves, are used in conjunction with the plain screen, the inspection capability of the plain screen will be greatly extended. The screen diameter is 14".

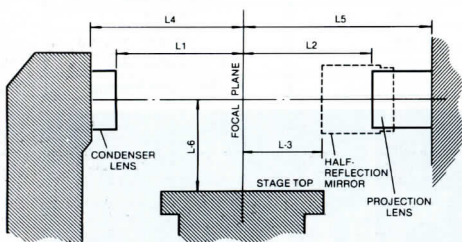
PROTRACTOR SCREEN NO. 172-155

The protractor is graduated to read in both clockwise and counter-clockwise directions. The main protractor ring has 1 degree increments and is read to 1 minute by the vernier scale. For general inspection purposes the protractor screen is highly recommended. The pre-packaged PH-350 standard set No. 172-944 shown on the preceding page also features this screen.

Because of the protractor ring around the glass screen, the image diameter is approximately 13 1/4" across.



Protractor Screen No. 172-155
and Plain Stage No. 172-135.

**WORK CLEARANCE**

The work clearance varies depending upon the magnification and stage selected.

5X and 10X magnification lens sets are supplied with a half-reflection mirror which is mounted on the projection lens (see illustration, broken line). 20X and 50X lens sets, on the other hand, are provided with a small half-reflection mirror/lens assembly which is placed inside of the lens housing.

Len Set No.	Magnif.	Half-Ref. Mirror	L1	L2	L3	L4	L5
172-150	5X	Snap-On	4.65"	6.26"	2.95"	7.32"	7.40"
172-151	10X	Snap-On	6.69"	3.07"	1.18"	7.32"	7.40"
172-152	20X	Self-Contained	6.81"	1.57"	1.57"	7.32"	7.40"
172-153	50X	Self-Contained	1.89"	.55"	.55"	7.32"	7.40"

Stage	L6	Vertical Stage Travel
Plainstage 172-131	5.31" (4.45" with Rotary Substage 172-171)	4"
Plainstage 172-135	5.31" (4.45" with Rotary Substage 172-171)	4"
Microstage 172-137	4.52" (3.66" with Rotary Substage 172-171)	4"



STAGES

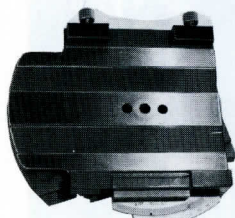
Three types of stages are available for PH-350, and, each one can be seated directly on the Rotary Substage No. 172-171. This substage has $1/2$ degree graduations, and, lets all stages swing ± 15 degrees to the optical axis, for measuring thread contours. The Microstage No. 172-137, shown below, is the most often specified stage for the PH-350. It has 6" travel, and, is supplied with a 1", .0001"-reading micrometer head.

OPTIONAL MICROMETER HEADS

The Microstage No. 172-137 has a 1" travel, .0001"-reading micrometer head. However,

this micrometer head can be interchanged with any one of the following optional micrometer heads.

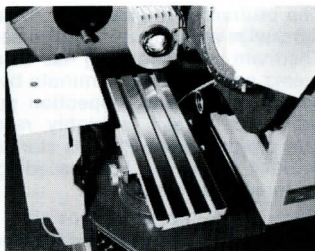
- 1) No. 252-392 Double-Counter Micrometer Head.
- 2) No. 297-201 Single-Counter, 0-2", Micrometer Head.
- 3) No. 164-945 0-2", 50-millionths reading, self-contained display "mike" head.
- 4) Series 164 See Series 164 pages for inch/metric dual-reading capabilities.



172-171

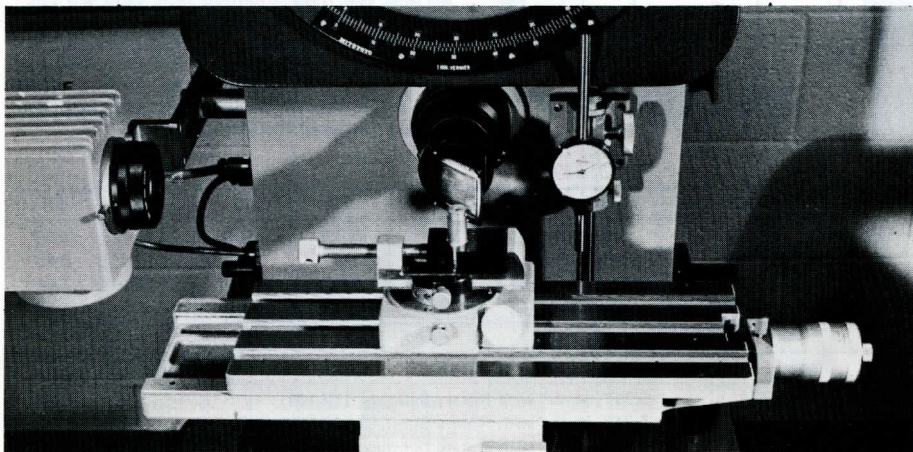


172-131



172-135

NAME	PLAIN STAGE, SMALL	PLAIN STAGE, LARGE	MICROSTAGE
CODE NO.	172-131	172-135	172-137
STAGE DIMENSION	10" x 6"	20" x 6"	16" x 6"
STAGE TRAVEL	---	---	6" (One Direction)
MICROMETER HEAD	---	---	1", .0001" Dual Reading



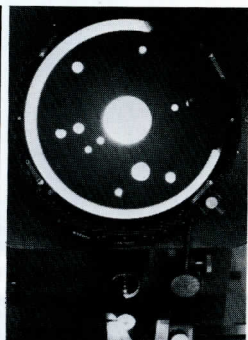
Microstage 172-137



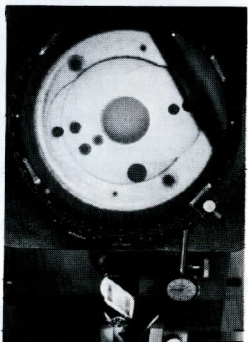
LENS SELECTION

All Lenses shown below are used for both PH-350 and PV-350.

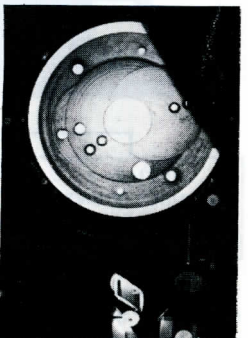
Condens. Lens	Condens. Lens	Project Lens	H-Refl. Mirror	SET NO.
				(5X Set) 172-150
The CONDENSER LENS for 10X, 20X, 50X Surface Illumination is supplied with Surface Illuminator No. 172-130.				(10X Set) 172-151 Furnished with Standard Package No. 172-944
				(20X Set) 172-152
				(50X Set) 172-153



(1) Contour Illumination

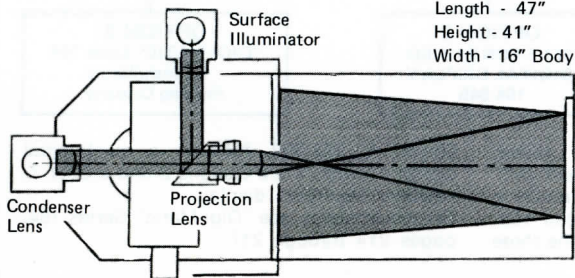


(2) Surface Illumination



(3) Surface and Contour Simultaneous Illuminations

PH-350 14" SCREEN - Top View



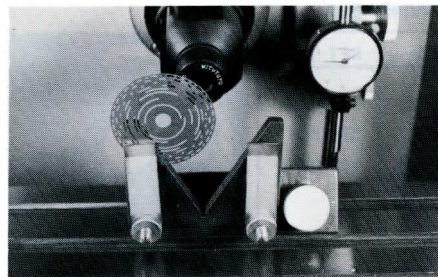
DIMENSIONS:

Length - 47"

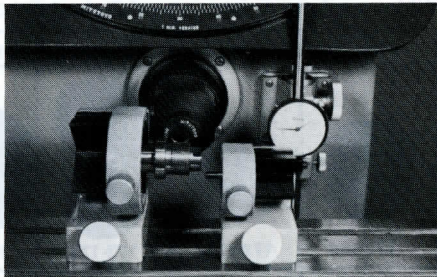
Height - 41"

Width - 16" Body

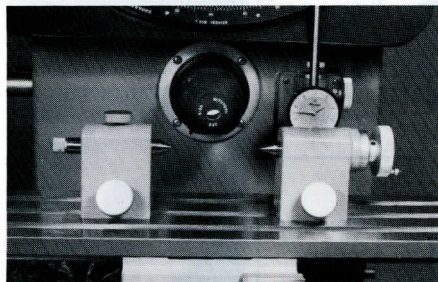
ACCESSORIES:



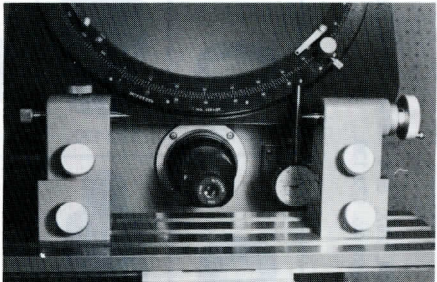
172-132 VERTICAL WORKPIECE HOLDER



172-142 CENTER STAGE

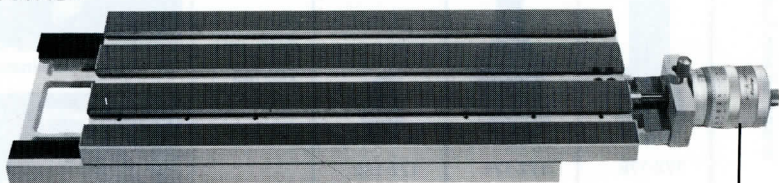


172-140 V-BLOCK SET (1" & 2" Capacity)



172-143 RISER FOR CENTER STAGE

MICROSTAGE



172-137

OPTION 1
DOUBLE COUNTER
MICROMETER HEAD
252-392

OPTION 2
SELF-CONTAINED
DIGITAL DISPLAY
164-945

OPTION 3
"DIGI-MATIC" Series 164
for Inch/Metric
Reading Capacity.

The **172-137 Microstage**, shown above, features a 0-1" micrometer head and 0-6" stage movement. If digital readout capability is desired, the furnished Micrometer Head 152-391, can be replaced by any one of the three options listed above.

Option 1, 252-392, features a mechanical digital counter, while Options 2 and 3 offer 7-segment electronic display. For more details, see "Digi-Matic" Series 164, pages 214 through 217.



PROFILE PROJECTOR Series 172, PH-350 (14" Screen)

BASIC UNIT

- 172-101-1** Including;
 Contour Illuminator and cooling fan
 930960 Power Supply Cord
 500379 Vinyl Dust Cover
 201131 2 pcs. Bulb 12V, 150W
 510188 2 pcs. Fuse 5A

LENSES

- 172-150** 5X Lens Set. Consists of;
 172-175 5X Projection Lens
 172-179 Condenser Lens (Surface)
 172-154 Condenser Lens (Contour) and
 172-183 Half-Reflection Mirror
- 172-151** 10X Lens Set. Consists of;
 172-172 10X Projection Lens
 172-176 Condenser Lens and
 172-180 Half-Reflection Mirror
- 172-152** 20X Lens Set. Consists of;
 172-173 20X Projection Lens
 172-177 Condenser Lens and
 172-181 Half-Reflection Mirror
- 172-153** 50X Lens Set. Consists of;
 172-174 50X Projection Lens
 172-178 Condenser Lens and
 172-182 Half-Reflection Mirror

SCREENS

- 172-146** Plain Screen
- 172-155** Protractor Screen 1 Minute w/vernier

STAGES

- 172-131** Plain Stage 10 x 6"
- 172-135** Plain Stage 20 x 6"
- 172-137** Microstage w/0-1", .0001" reading micrometer head. 0-6" stage movement.

ACCESSORIES FOR STAGES

- 172-140** Vertical V-Block and Clamp Set
 172-140-1 1" DIA. capacity
 172-140-2 2" DIA. capacity
- 172-141** Horizontal V-Block and Clamp Set
 172-141-1 1" DIA. capacity
 172-141-2 2" DIA. capacity
- 172-142** Center Stage. Capacity 4.7" DIA.
- 172-143** Riser for Center Stage
- 172-144** Rotary Vise, 5 degrees increments
- 172-171** Rotary Substage ± 15 degrees
- 172-231** Vertical Measuring Attachment

ILLUMINATORS

- 172-129** Contour Illuminator (part of basic unit)
- 172-130** Surface Illuminator

VERTICAL MEASURING ATTACHMENT

- 172-231** Vertical Measuring Attachment for dial indicator

STAND

- 050002** Steel Caster Stand for PH-350

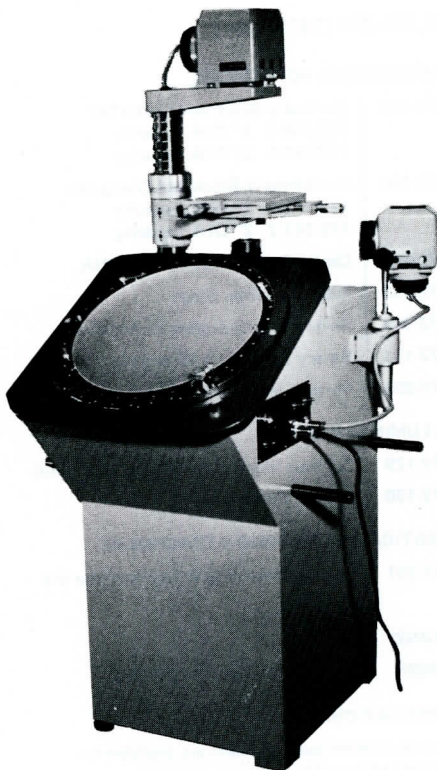
OVERLAY CHARTS

Inch and Metric overlay charts are available for PH-350 14" screen. For more information, see page 264 and 265.

172-944 PH-350 Standard Set

Consists of following items

- 172-101-1** Basic Unit
- 172-155** Protractor Screen, 1 minute reading
- 172-151** 10X Lens Set
- 172-130** Surface Illuminator
- 172-137** 0-6" travel Microstage with 0-1" .0001" reading micrometer head.
- 172-231** Vertical Measuring Attachment
- 2424** Dial Indicator 0-2" travel .001" graduation



**STANDARD PACKAGE
SET NO. 172-931
(14" Screen)**

The PV-350 is a general purpose 14" screen profile projector designed for contour and surface inspections. This floor model is designed in such a manner that the inspector can work comfortably in a sitting position while concentrating his attention on the screen.

Unlike the other 14" model, PH-350, described in this catalog, the screen area on the PV-350 is fully exposed to the inspector. This screen position allows him to easily trace magnified images or make his own overlay charts using a blank frosted sheet (Part No. 200665). The application shown on the following page is a typical example.

PROFILE PROJECTOR

Series 172

PV-350 Floor Model (14" Screen)

(Vertical Optical Beam)

Features

- Choice of 4 magnifications; 5X lens for wide field of view, 10X lens for general purpose, 20X lens for closer observation, and 50X lens for high precision work.
- Choice of 4 stages; plain stage No. 172-149, 1x1" travel .001" microstage with rotary No. 172-158, 2x2" travel .001" microstage with rotary No. 172-187, 2x2" travel .001" microstage No. 172-189 (part of the standard package).
- Choice of 2 screens; Protractor No. 172-155 or plain screen No. 172-146 (same screen is used on both PH-350 and PV-350 models).
- 3-step intensity adjustable contour illumination.
- Wide variety of standard overlay charts makes inspection effective.

STANDARD PACKAGE SET No. 172-931

The most popular package No. 172-931 shown here includes:

- 1) Basic Unit No. 172-102-1
- 2) Protractor Screen No. 172-155
- 3) 2x2" travel .001" Microstage No. 172-189
- 4) 10X Lens Set No. 172-151
- 5) Surface Illuminator No. 172-148

STANDARD PACKAGE SET No. 172-930

This package is furnished with Plain Screen No. 172-146 instead of the Protractor Screen.

- 1) Basic Unit No. 172-102-1
- 2) Plain Screen No. 172-146
- 3) 2x2" travel .001" Microstage No. 172-189
- 4) 10X Lens Set No. 172-151
- 5) Surface Illuminator No. 172-148

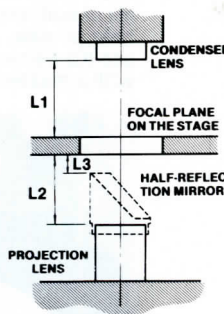


Work Clearance

One of the benefits of the PV-350 Profile Projector is that once you focus the image, the established focal plane stays on the top surface of the stage unless you alter it otherwise.

The focal plane is predetermined by the stage position and rarely needs further adjustments. As the following dimensions indicate, the work clearance is ample for most measuring applications.

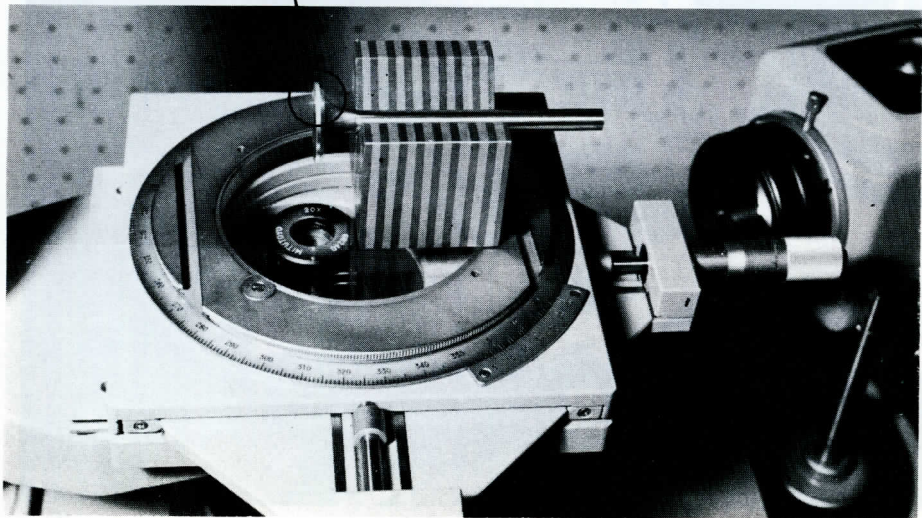
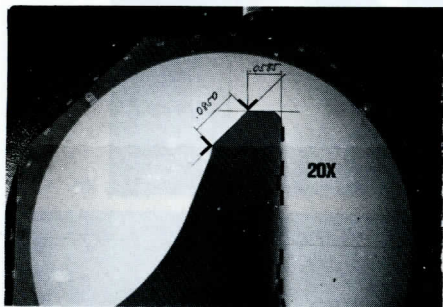
Lens Set Code No.	Magnif.	Half-Ref. Mirror	L1	L2	L3
172-150	5X	Snap-On	4.63"	6.06"	2.77"
172-151	10X	Snap-On	6.67"	2.86"	.98"
172-152	20X	Self-Contained	6.81"	1.38"	1.38"
172-153	50X	Self-Contained	1.89"	.36"	.36"



APPLICATION EXAMPLE

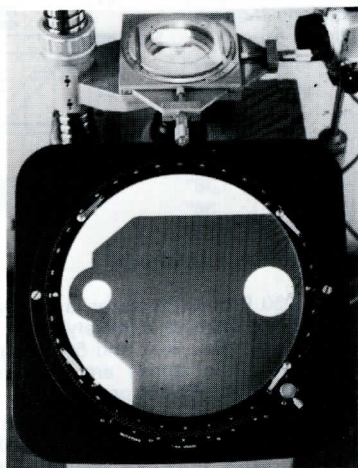
The PV-350 Profile Projector is designed to measure and inspect relatively small workpieces in 5X, 10X, 20X, and 50X magnifications. The same lenses are used for the PH-350 as for the PV-350 projector.

The screens are also the same. In the application shown below, the angle and edge dimensions on a valve are inspected at 20X magnifications. The chart on the screen is a home-made version prepared by the user. Frosted blank sheets are available from Mitutoyo (Part No. 200665) to make up your own overlay charts.

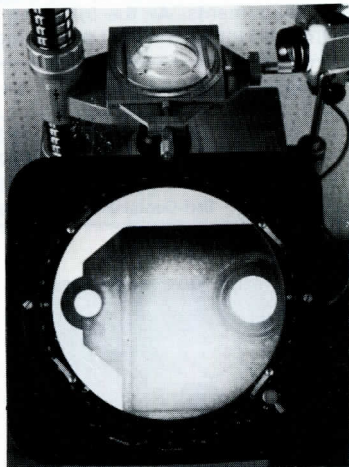




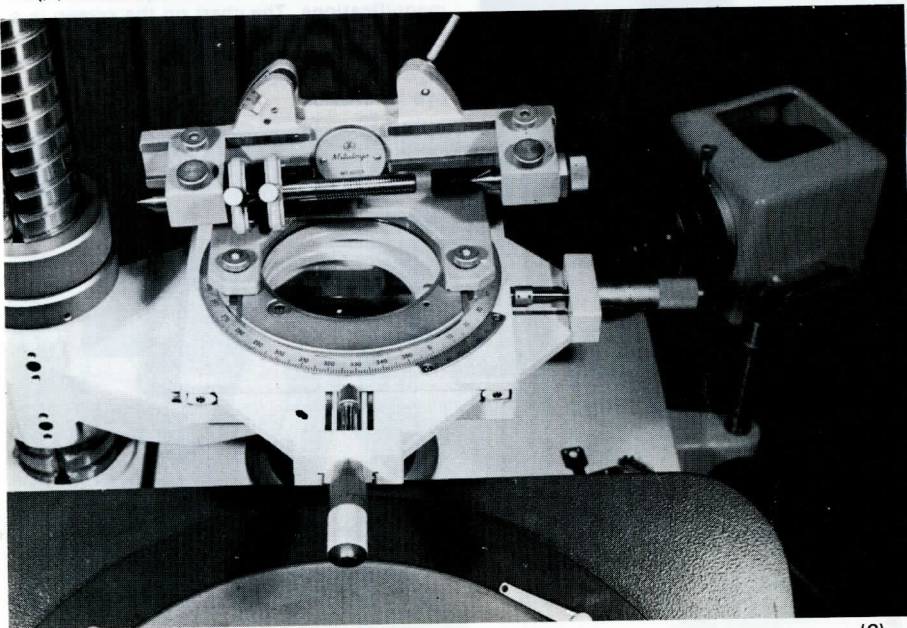
The PV-350 offers contour illumination (see photo A), surface illumination (B) or both simultaneously. It also features 5X magnification lens for greater field of view. Additional accessory, such as the Center Support 172-159, see (C) below, makes it possible to check threads and to compare these with a master overlay chart.



(A)



(B)



(C)



PROFILE PROJECTOR

Series 172, PV-350 (14" Screen)

BASIC UNIT

- 172-102-1** Includes;
 Contour Illuminator with cooling fan
930076 Power Supply Cord
510229 Vinyl Dust Cover
200727 2 pcs. Bulb 12V, 100W
510188 2 pcs. Fuse 5A

LENSES

- 172-150** 5X Lens Set. Consists of;
172-175 5X Projection Lens
172-179 Condenser Lens (Surface)
172-154 Condenser Lens (Contour) and
172-183 Half-Reflection Mirror
- 172-151** 10X Lens Set. Consists of
172-172 10X Projection Lens
172-176 Condenser Lens and
172-180 Half-Reflection Mirror
- 172-152** 20X Lens Set. Consists of
172-173 20X Projection Lens
172-177 Condenser Lens and
172-181 Half-Reflection Mirror
- 172-153** 50X Lens Set. Consists of
172-174 50X Projection Lens
172-178 Condenser Lens and
172-182 Half-Reflection Mirror

SCREENS

- 172-146** Plain Screen
172-155 Protractor Screen 1 Minute w/vernier

STAGES

- 172-149** Plain Stage
 Dimension 6 x 6"
- 172-158** Microstage. Travel 1 x 1", .001"
 Dimension 6.7 x 6.7"
- 172-187** Microstage. Travel 2 x 2", .001"
 Dimension 6.7 x 6.7" with Rotary Plate
- 172-189** Microstage. Travel 2 x 2", .001"
 Dimension 6.7 x 6.7"

ILLUMINATOR

- 172-148** Surface Illuminator with 10X, 20X and
 50X Condenser Lens

CANOPY

- 172-163** Black Curtain Canopy specially designed
 for PV-350

GLASS SCALES

- 172-117** Standard Scale 2", .010"
172-162 Reading Scale 12", .020"

FILTERS

- 172-160** Set of Red and Green Filters
172-160-1 Red Filter
172-160-2 Green Filter

Standard Unit No. 1

- 172-930** Consists of following items
- 172-102-1** Basic Unit with Contour Illuminator and cooling fan
 - 172-146** Plain Screen
 - 172-148** Surface Illuminator
 - 172-151** 10X Lens Set
 - 172-189** 2 x 2" Microstage

Standard Unit No. 2

- 172-931** Consists of following items
- 172-102-1** Basic Unit with Contour Illuminator and cooling fan
 - 172-155** Protractor Screen 1 Minute w/vernier
 - 172-148** Surface Illuminator
 - 172-151** 10X Lens Set
 - 172-189** 2 x 2" Microstage



The "PV-600" is a 24" Screen Profile Projector designed for various applications where a larger field of view is an essential requirement.

The Projector comes either with Plain Screen or Protractor Screen reading 1 minute with Vernier Scale.

The Contour Illuminator with built-in Color Filter Turret projects a vividly sharp image on the wide screen.

The control panel is conveniently located within easy reach of the operator. Focusing is adjusted by the feed wheel which raises the Stage Location.

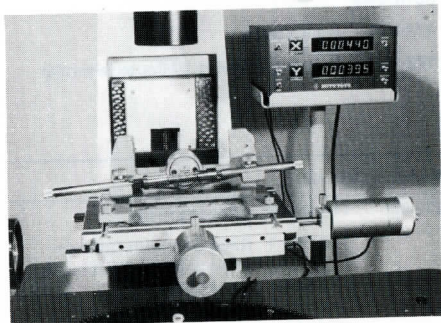
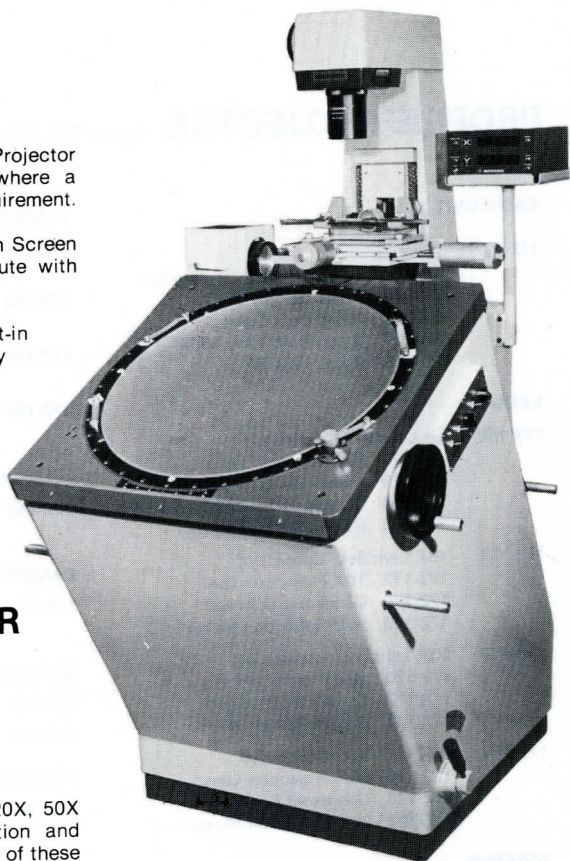
PROFILE PROJECTOR

Series 305

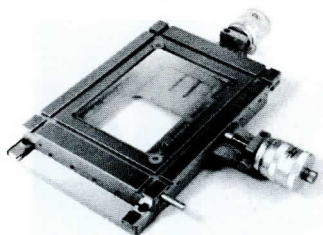
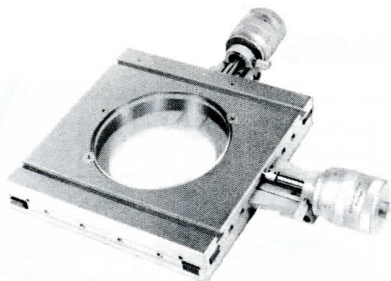
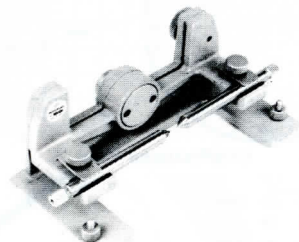
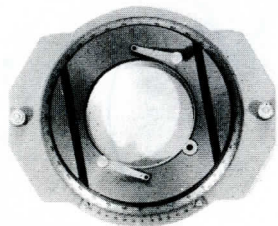
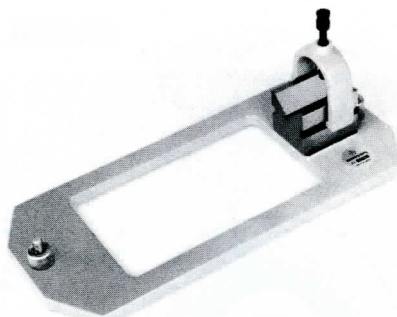
PV-600 Floor Model (24" Screen)

PV-600 Profile Projector has 10X, 20X, 50X and 100X lenses with high resolution and magnification accuracy. Field of view of these lenses are 2.4", 1.2", .472" and 240" respectively. The surface characteristics can be inspected by either a half-reflection mirror or an oblique surface reflection mirror which is highly effective in inspecting scratches, engravings or minute details on the work surface. Surface and Contour illuminations have an independent brightness adjusting switch to provide the right intensity for best viewing. Dimension: 70" (Height) x 39" (Width) x 44" (Depth).

Accessories listed on this page and other attachments and accessories are described in a separate bulletin. For more information, request Bulletin-PV-600. Prices will be quoted upon request.



2 x 4" Travel Stage 172-317 and
Optional "Digi-Matic" Series 164

**172-317 4 x 2" TRAVEL MICROSTAGE****172-313 2 x 2" TRAVEL MICROSTAGE****172-197 SWIVEL CENTER SUPPORT****172-196 ROTARY MEASURING STAGE****172-301 10X LENS SET****STAGE WITH V-BLOCK (172-210)**

No.	Description
305-101	Basic Unit
172-301	10X Lens Set
172-302	20X Lens Set
172-303	50X Lens Set
172-304	100X Lens Set
172-307	24" Plain Screen
172-308	24" Protractor Screen
172-309	Plain Stage
172-313	2 x 2" Travel Microstage
172-317	4 x 2" Travel Microstage
172-319	Curtain Canopy
172-320	10X Projection Lens only
172-321	10X Condenser Lens for Surface Illuminator
172-322	Half-Ref. Mirror for 10X Lens
172-323	20X Projection Lens only
172-324	20X Condenser Lens
172-325	Half-Ref. Mirror for 20X Lens
172-326	50X Projection Lens only
172-327	50X, 100X Condenser Lens
172-328	100X Projection Lens only



OVERLAY CHARTS

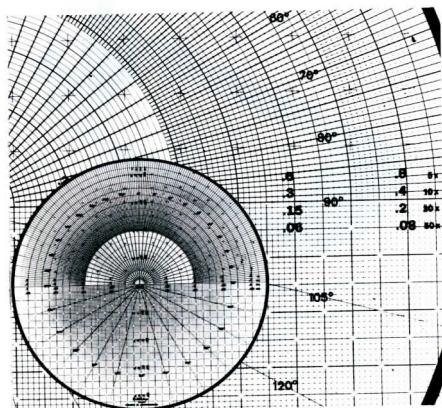
All MITUTOYO Profile Projectors have a frosted screen with crossed hair lines. The transparent overlay charts shown here, both inch and metric, are to be placed directly on the screen.

The charts are laminated on both sides. Blank frosted sheet (Part No. 200665) is also available for in-house use.

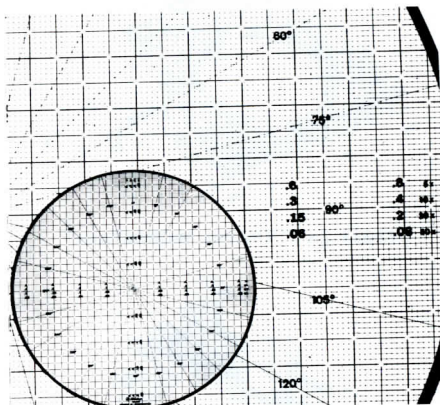


MITUTOYO Overlay Charts are transparent and are placed directly on the screen.

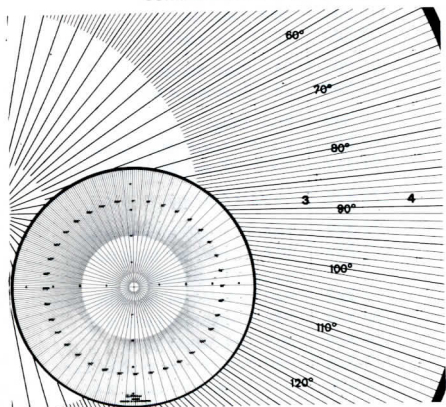
OVERLAY CHARTS



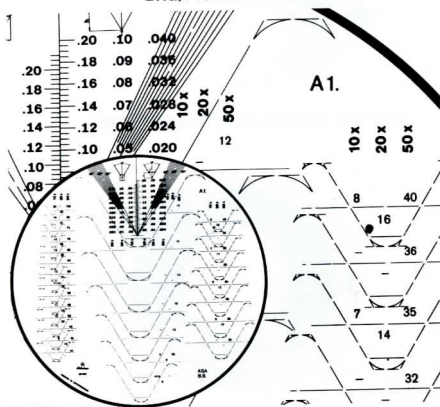
Combination Chart



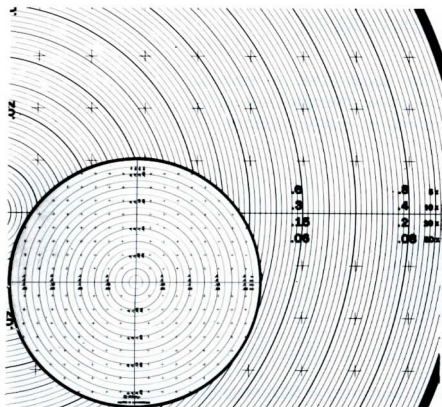
Grid/Protractor Chart



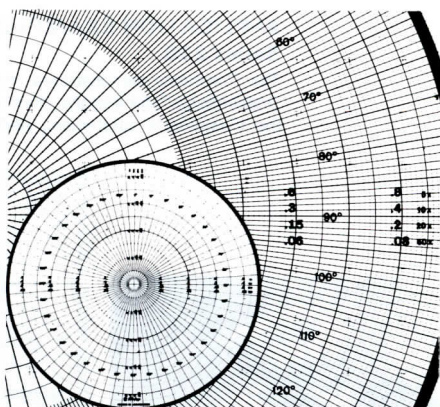
Protractor Chart



Screwthread Chart



Radius Chart



Radius/Protractor Chart

	Description	For PJ-250C (10" Screen)	For PJ-300 (12" Screen)	For PH & PV-350 (14" Screen)
Inch Overlay Chart For 5X, 10X, 20X & 50X Magnifications	Combination Chart	201301	511344	201305
	Grid/Protractor Chart	201302	511345	201306
	Protractor Chart	201303	511346	201307
	Screw Thread Chart	201304	511347	201308
	Radius Chart	201490	511348	201491
	Radius/Protractor Chart	201492	511349	201493

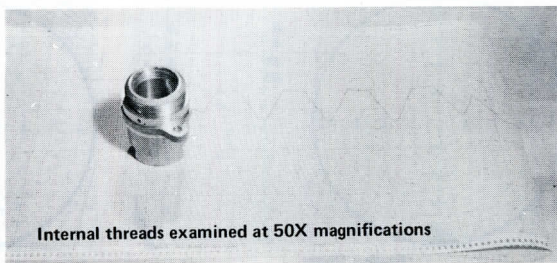
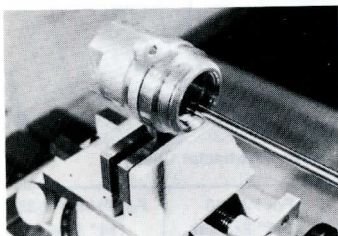
	Description	For PJ-250C (10" Screen)	For PJ-300 (12" Screen)	For PH & PV-350 (14" Screen)
Metric Overlay Chart For 10X, 20X, 50X & 100X Magnifications	Grid/15° Protractor Chart	201380	201386	201392
	Radius/10° Protractor Chart*	201381	201387	201393
	Radius Chart*	201382	201388	201394
	Protractor Chart*	201383	201389	201395
	ISO Thread Chart	201384	201390	201396
	Acme Thread Chart	201385	201391	201397

* with 10mm Grid on Chart

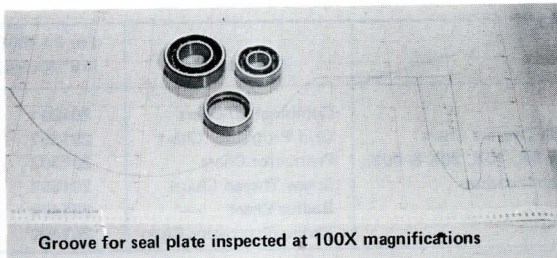
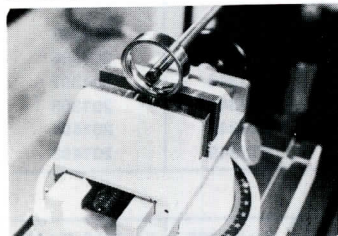


APPLICATION EXAMPLES, CONTRACER Series 218

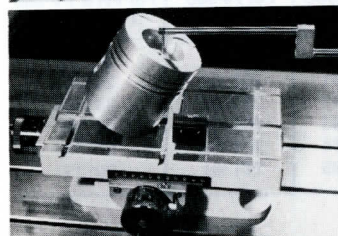
The Contracer demonstrates remarkable capabilities in reaching "inaccessible" dimensions. Here are just a few examples indicating the Contracer's outstanding performances in quality control.



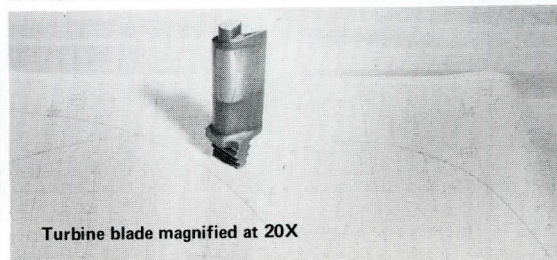
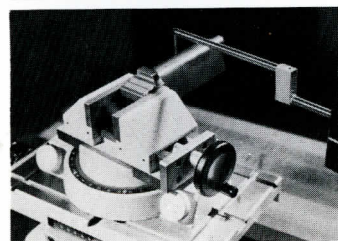
Internal threads examined at 50X magnifications



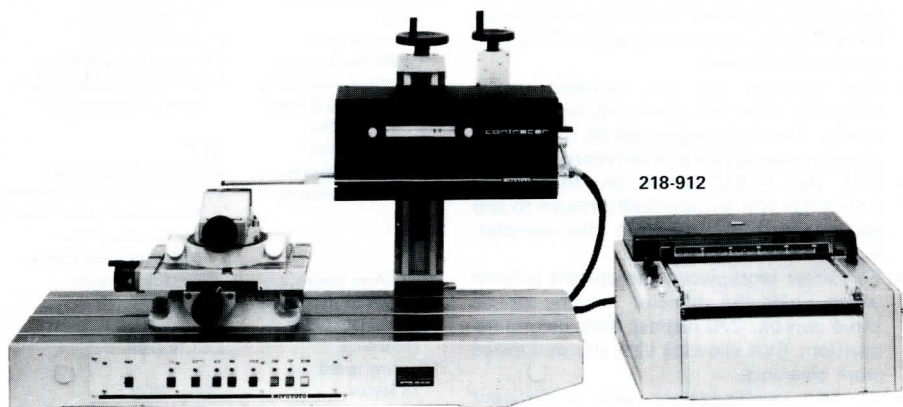
Groove for seal plate inspected at 100X magnifications



Cylinder head contour checked at 10X magnifications



Turbine blade magnified at 20X



CONTRACER Series 218

The MITUTOYO Contracer is a low magnification profile measuring/charting instrument that offers an additional gaging capability to the quality control and dimensional surveillance of the products. The heart of the Contracer is the combination of a tracing stylus, linear variable differential transducer and a precision charting unit, all engineered and manufactured by MITUTOYO.

The Contracer magnifies the contour and records it on the grid chart. The available magnifications are 1, 2, 5, 10, 50, 100 and 200X.

Applications

There are unlimited measuring applications where only the Contracer can be the logical answer. Here are some examples:

1. Female screw thread profile: No non-destructive means of close inspection available. The Contracer with its tracing arm/stylus and variable magnifications is the answer.
2. Contour of turbine blades and propellers: Cross section of a given area can be quickly inspected by the Contracer. Drawing on the contours selected from different areas repeatedly on the same chart reveals the blade cross section in relation to the other areas.
3. Cams: The contour of cams can be accurately checked by the Contracer. If the rotary center with a motor drive (No. 218-006) is utilized, the entire circumference of a cam can be developed into a linear chart. The physical distance or depth in relation to the cam surface can be also measured on the chart.
4. Waviness: A surface roughness tester indicates the average roughness heights but omits waviness. The Contracer picks up not only the waviness but also chatters and other surface irregularities.
5. Tapered holes and concave forms: Female tapers, hemi-spheres, concaves and the like have virtually no measuring means. The coordinating measuring machine can be an answer but it does not magnify and is not designed or intended to check these hard to measure items. The Contracer is again the logical conclusion.
6. Dies and molds: The master dies and molds must be analyzed first in order that the productions parts meet the specifications. The Contracer is also highly recommended for this gaging application.

Features

- The tracing arm/stylus can be operated by the motor drive (AUTO switch) with a constant velocity or manually when MANUAL switch is depressed.
- The recorder can be operated simultaneously with the main unit or independently. The chart paper can be rolled back allowing overlapped profile recordings.
- With the AUTO switch on, the tracing arm/stylus will automatically return to and rest at the starting position after completing the measurement.
- For larger workpieces, the upright column which holds the detector housing can be tilted approx. 270 degrees from its original position, thus allowing virtually unlimited work clearance.
- 11 arm configurations plus 9 different styluses are prepared to meet all measuring requirements.

Accuracy of Magnification Measured on the Recording Paper.

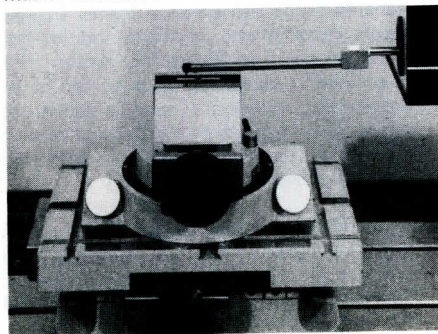
Recorded width	Vertical Axis	Horizontal Axis
Less than 10"	$\pm .04''$	$\pm .04''$
Over 10"	-----	$\pm .004''$ L

(L=recorded width)

The accuracy stated above is for all magnifications checked on the recorded paper.

At 200X magnifications for example, a vertical drop of .050" is magnified to 10" on the recording paper. The recorded accuracy is $\pm .04''$, which means 0.4% magnification accuracy, or $\pm .0002''$ of the actual workpiece.

The Contracer is first checked with a supplied master reference.



Specifications

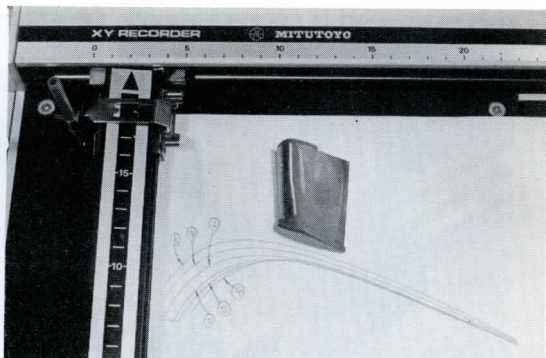
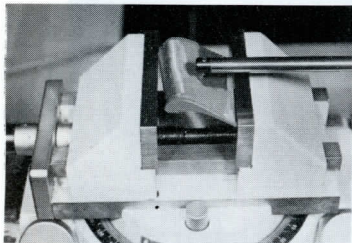
Maximum measuring range:	1.57" (vertical) x 4" (horizontal).
Power drive unit positioning range:	9" vertical travel.
Power drive supporting column adjustment:	± 10 degrees inclination.
Tip radius of the tracing stylus:	4.72" horizontal adjusting range. Rotates 270°.
Measuring pressure:	.001"
Stylus/Arm movement:	Approx 3g(adjustable)
	Both automatic and manual.
	Manual feed is for fine positioning of the stylus on a workpiece.
Stylus/Arm travel limit:	Adjustable 4" scale.
Direction of the Stylus movement while recording:	Left to right.
Traveling speed of stylus:	.004, .040IPS.
Maximum traceable angle:	Ascent approx. 75 degrees.
Base table work area:	Descent approx. 85 degrees.
Overall table dimension:	37.4 (width) x 11.8" (depth).
	37.4 (width) x 11.8" (depth) x 4" (thickness).
Recording magnifications:	1, 2, 5, 10, 20, 50, 100 & 200X. Vertical and horizontal axis selected individually.
Recording width:	10" (maximum grid chart width).
Ruled graduations:	0.1 x 0.1" (actual grid on the recording paper).
Weight:	Approx. 215 Lbs.(main unit)
	Approx. 26 Lbs. (recorder)
Code No:	218-912

Standard Accessories

Recording Pen	2 pcs.	530620
Red Ink 50cc	1 bottle	
Recording paper	5 roles	521899
Connecting cord (main unit)		931289
(recorder)		930290
Power supply cord		931288
Calibration master reference	1 pc.	930244
Stylus	4 pcs.	531815
	3 pcs.	531816
	3 pcs.	532275
Standard arm unit	1 pc.	930511
Arm unit, deep groove	1 pc.	930591
Tool set	1 set.	
Vinyl cover	1 pcs.	532945
Spare fuse 1A(recorder)		
Spare lamps		



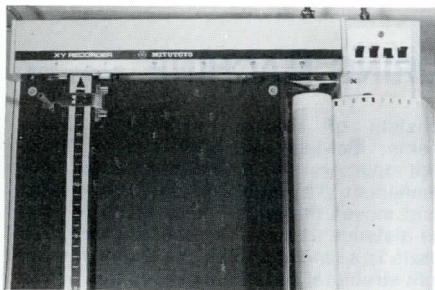
APPLICATION EXAMPLE X-Y RECORDER



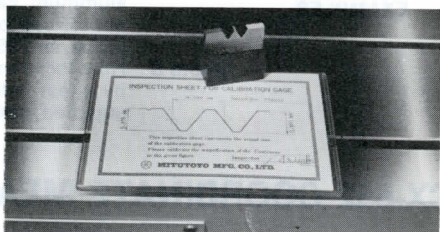
X-Y Recorder for Contracer 218-915-A3 Model

CONTRACER Series 218 with X-Y Recorder

In addition to all the features described on the preceding pages, the Contracer with X-Y Recorder 218-915-A3 offers a stationary X-Y recording mode, as well as the rolled chart method featured by the standard Contracer. A black sheet of paper or grid chart can be placed on the recorder for X-Y recording. The example, shown above, is X-Y recording of a blade contour at 5X magnifications on both X and Y axes. The maximum recording area is 15" x 10".



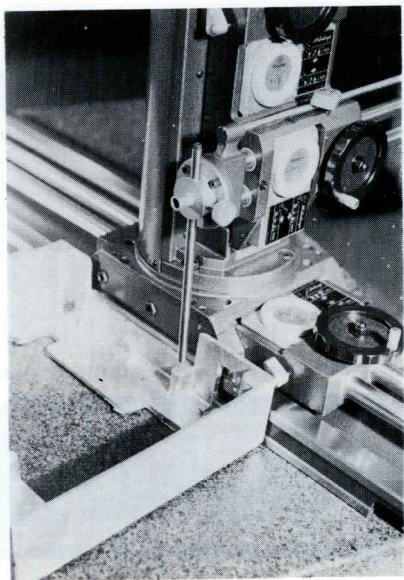
Control Unit for 218-915-A3 Model



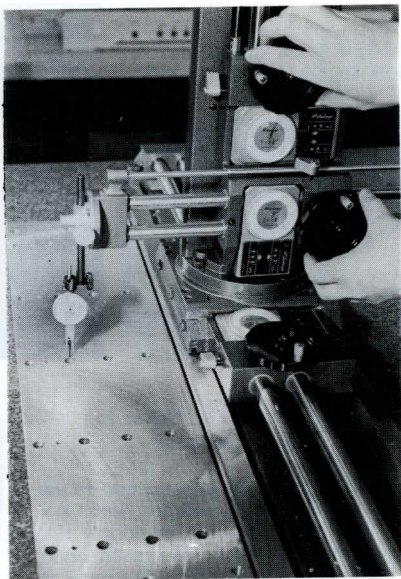
The Contracer with X-Y Recorder is furnished with a control unit, shown above, which interfaces Contracer to the X-Y plotting recorder.

A calibrated special block, also shown above, is supplied with the Contracer to check magnification accuracies.

Model	No.	Range	Magnifications
Contracer	218-912	4(H) x 1.57"(V)	1, 2, 5, 10, 20, 50, 100, 200X
Contracer with X-Y Recorder	218-915-A3	4(H) x 1.57"(V)	1, 2, 5, 10, 20, 50, 100, 200X



A



B

APPLICATION EXAMPLES

Photo A Establishing hole locations, in X-Y coordinates, on an aluminum casting. The standard scribe (shown in photo) can be interchanged with an optional punch probe, No. 952855, for positive marking.

Photo B Hole locations, in X-Y coordinates, are being checked by a test indicator. Holding bar for the indicator is a supplied, standard accessory.

CX-652 COORDINATE MEASURING MACHINE Series 198

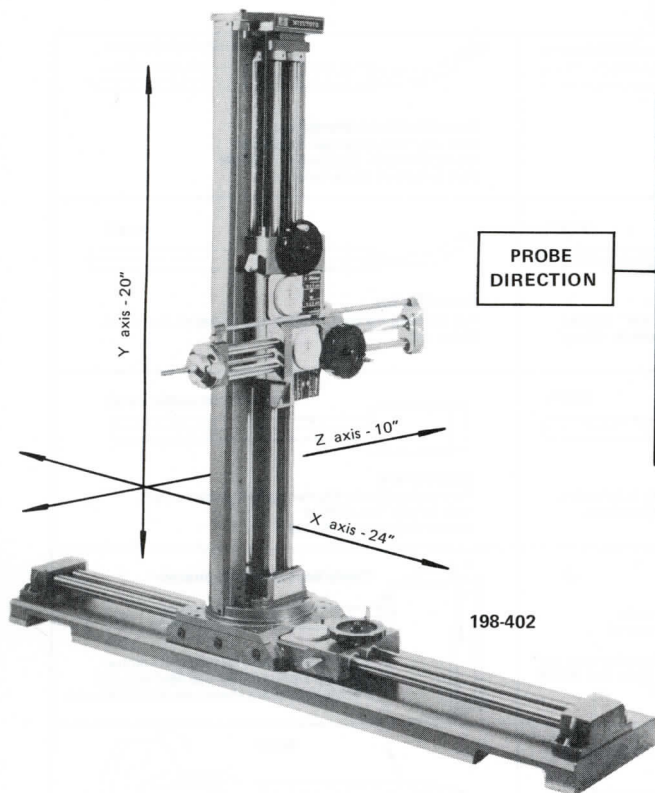
The MITUTOYO CX-652 Coordinate Measuring Machine is a production tool and an inspection instrument. It may be used to measure and locate positions on large workpieces, such as castings and forgings, and, it can be used to check X, Y and Z coordinates, during and after machining operations.

The CX-652 CMM assures accuracies to .001" for the inch model (198-402), 0.01mm for the metric model (198-401), within its 24" horizontal (X), 20" vertical (Y) and 10" depth (Z) dimensional capabilities.

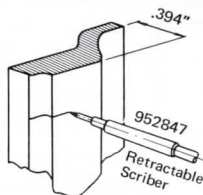
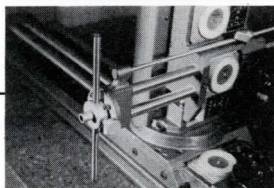
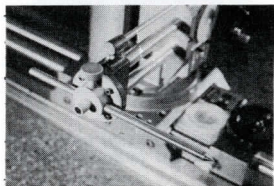
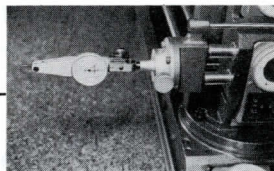
The measuring functions of the CX-652 CMM are completely mechanical and derive their accuracy and constant repeatability from MITUTOYO's unique axis design. Each axis

consists of parallel, cylindrical guide-beams; dial-face and bi-directional, three-digit counters and a rack-and-pinion drive mechanism. The highly reliable drive mechanism moves the gage heads which register the distance traversed on the counters. The Z-axis is suspended from the top of the upright structural column and a counter-weight is housed inside the column, to provide smooth, precise vertical-movement. A zero-setting button is standard on the digital counters.

The bottom surface of the CX-652 CMM, measuring approximately 40" x 8", is finely ground to provide a reference plane for granite surface plates with which it is generally used.



PROBE
DIRECTION



The spring-loaded, retractable scriber (No. 952847) can scribe continuous lines on irregular surfaces. The range of plunger motions is .39".

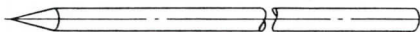
ACCESSORIES

Two standard probe attachments are furnished with the unit, and many more special probes are available, as shown on the following pages. When optional attachments are fully utilized along with other MITUTOYO tools, such as the Center Master No. 900581, the CX-652 Coordinate Measuring Machine becomes a complete gaging equipment, reading in thousandths, for large workpieces.

PROBE DIRECTION

The direction of probe can be set to each axis, as illustrated above, to facilitate measurements in X-Y-Z coordinates.

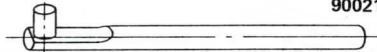
952903



Standard Scriber

.315" DIA. steel rod. Length 8 1/4". For scribing flat surfaces. Point-to-point measurements. General purpose.

900211


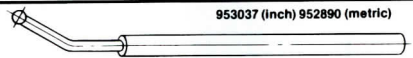
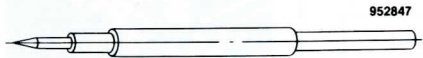

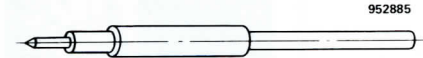
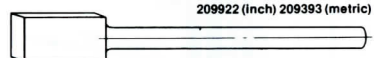
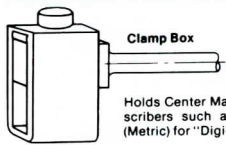
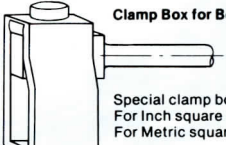
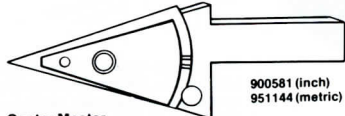
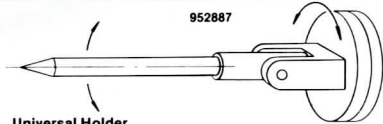
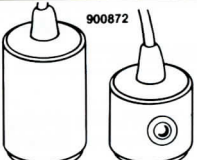
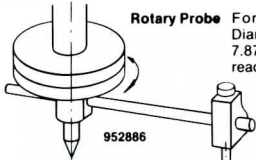
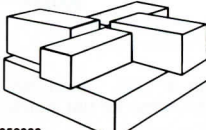



Holder for Test Indicator

Shank .315" DIA. Length 4 1/2". Both No. 900291 and 900322 universal clamp for test indicators can be mounted.

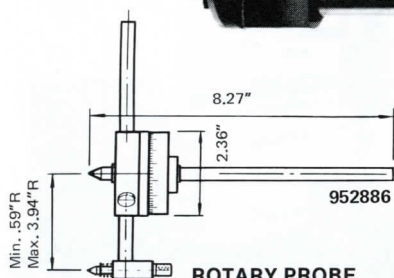


OPTIONAL ACCESSORIES

 <p>953036 (inch) 952884 (metric)</p> <p>Ball-Point Attachment Inch .200" DIA. steel ball No. 953036 Metric 4mm DIA. steel ball No. 952884 For general measuring purpose.</p>	 <p>953037 (inch) 952890 (metric)</p> <p>Curved Ball-Point Attachment Inch .200" DIA. steel ball No. 953037 Metric 4mm DIA. steel ball No. 952890 For top/bottom lands, holes etc.</p>
 <p>952847</p> <p>Retractable Scriber For scribing irregular surfaces. Up to .394" convex/concave and other irregularities. Carbide tipped point.</p>	 <p>952889</p> <p>Curved Scriber For scribing corners, top/bottom surfaces, inside of holes, etc.</p>
 <p>952885</p> <p>Punch For punching purpose. The inside spring is activated when the punch is pushed against a work surface.</p>	 <p>209922 (inch) 209393 (metric)</p> <p>Square Shank For holding Center Master, Bevel Protractor, etc. Inch 1/2"x1/4" No. 209922 Metric 12x9mm No. 209393</p>
 <p>Clamp Box 900171 (Inch) 900166 (Metric)</p> <p>Holds Center Master (see following page) and scribers such as 900258 (Inch) and 900168 (Metric) for "Digi-Count-Hite."</p>	 <p>Clamp Box for Bevel Protractor 950749 (inch) 950750 (metric)</p> <p>Special clamp box for bevel protractor. For Inch square shank use 950749 (Inch) For Metric square shank use 950750 (Metric)</p>
 <p>900581 (inch) 951144 (metric)</p> <p>Center Master For hole center to hole center measurements. Capacity (largest measurable hole) 1 1/2" DIA.</p>	 <p>952887</p> <p>Universal Holder Hold only, no probe supplied. Accepts .315" DIA. rod type probes.</p>
 <p>900872</p> <p>Contact Sensor Two permanent magnets. One to be attached on the workpiece, the other on the instrument. The moment of contact will be indicated by a red light. Battery included.</p>	 <p>952886</p> <p>Rotary Probe For scribing circles. Diameter from 3.149" to 7.874". With 2 degree reading protractor.</p>
 <p>952888</p> <p>Original Point Block To establish original point during measurements and after, the probe is interchangeable from one to another.</p>	 <p>187-904</p> <p>Universal Bevel Protractor For angle measurements. For mounting, use clamp No. 950749 (supplied with the protractor) and square shank No. 209922.</p>



Each axis is featured with its own bi-directional digital counter and individual zero-resetting button. The starting zero point can easily be set at any desired point within the range.



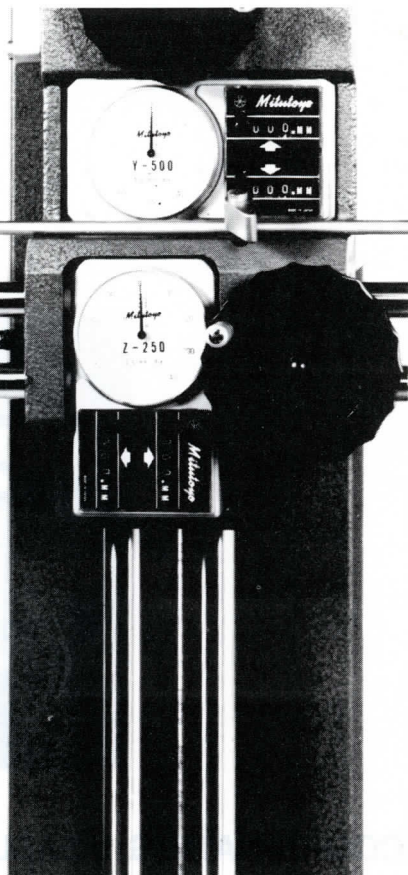
952886

ROTARY PROBE

Minimum radius .59" to maximum 3.94". With carbide-tipped, preloaded scriber.

Can be mounted on all XYZ directions.

198-401



SPECIFICATIONS: Furnished Standard Accessories

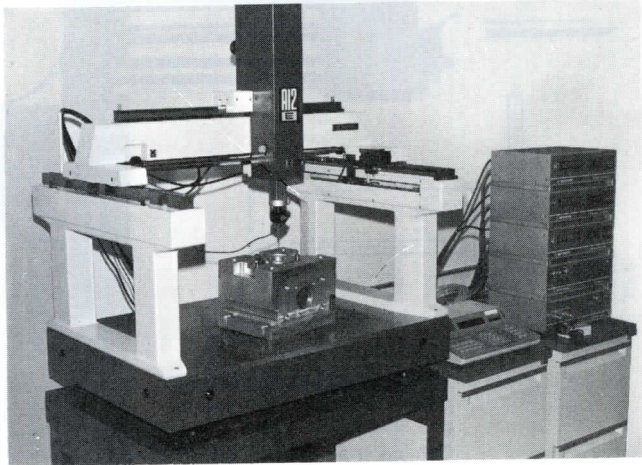
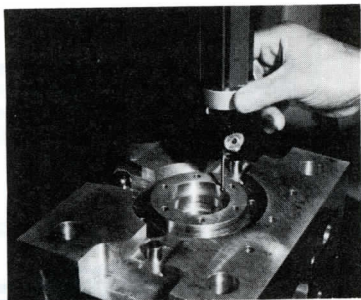
952903 1 pc. Scriber

900211 1 pc. Holder for test indicators

Dimensions 40" (Length) x 37" (Height) x 20" (Width)

Weight 158 Lbs.

	No.	Measuring Range			Smallest Reading	
		X-axis	Y-axis	Z-axis	Dial	Counter
Inch	198-402	24"	20"	10"	.001"	.100"
Metric	198-401	600mm	500mm	250mm	0.01mm	1mm



COORDINATING MEASURING MACHINE

AE121

MITUTOYO has been manufacturing a wide variety of coordinating measuring machines ranging from the small AE121, shown above, to the huge 16 feet long CMM, which is used to measure nuclear generator's regulating tubes. The standard model AE121 is constructed with micro-lapped, specially-designed XYZ guide beams and an array of precision roller bearings. This design concept, potentially superior than the air bearings, is the heart of accuracy. The hundreds of MITUTOYO CMMs now in active use in major plants prove MITUTOYO's technical achievements and experience in the engineering of coordinating measuring machines.

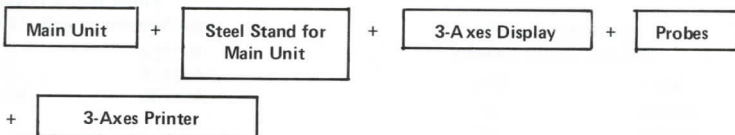
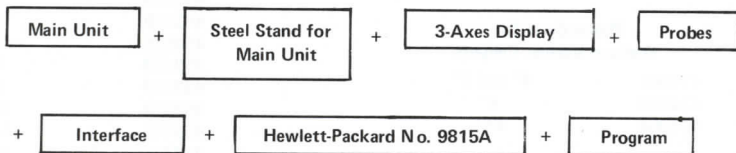
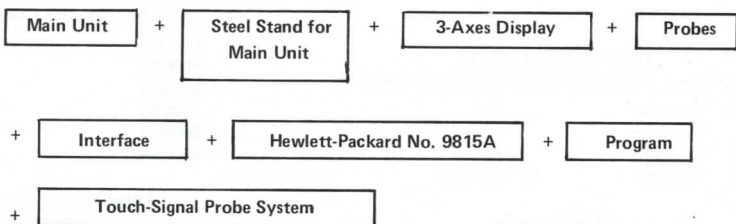
The photo, above shows the AE121 model with XYZ displays, touch-signal probe and Hewlett-Packard No. 9815A table-top calculator.

MITUTOYO supplies a complete set of inspection data sheets revealing XYZ independent accuracy taken at various positions and heights on each axis. The purpose of furnishing this inspection data is to show the actual accuracy on each cubic area, which is well within the overall accuracy.



SELECTION GUIDE

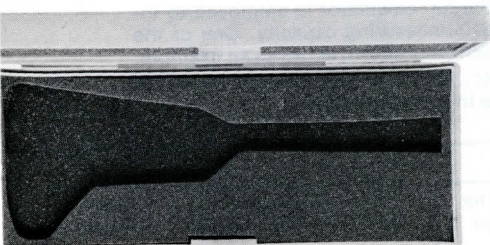
- It is entirely possible to select the basic AE121 configuration, which is Mode 1, first, and then to build up the unit by adding optional equipment.
- In Mode 3 and Mode 4, a table top calculator is employed to increase dramatically the AE121's measuring capacity. One of the Hewlett-Packard models No. 9815A is shown above as an example.
- Standard program for H-P No. 9815A is programmed by MITUTOYO, and is readily available in a cassette form.

Mode 1**Mode 2****Mode 3****Mode 4**

For more information, request AE121 Bulletin.



FITTED WOODEN & PLASTIC CASES



414001

Soft Fitted Cases for Dial and Vernier Calipers

No.	Size
411001	4"
411002	6"
411003	8"
411005	12"

Plastic Cases for Dial and Vernier Calipers

414001	4" and 6"
414003	8"
414004	12"

Fitted Plastic Case for Dial and Vernier Calipers

414001	6"
--------	----

Fitted Wooden Cases for

Height Gages, Dial Height Gages and Digit Count-Hites

413030	6"
413031	10"
413060	12"
413061	18" and 24"

Fitted Cases for

Small Hole and Telescoping Gages

454001	Small Hole Gage
454002	Telescoping Gage

Fitted Wooden Cases for Outside Micrometers (101, 102, 103 series only)

No.	Size
470408	1"
453007	7"
453008	8"
453009	9"
453010	10"
453011	11"
453012	12"
453025	0-3" set
453026	0-6" set
453027	0-12" set
453028	6-12" set

Fitted Plastic Case for Digit Micrometers and Combimikes (159 and 193 series only)

453161	1"
453163	2"
453165	3"
453167	4"

Fitted Wooden Cases for Digit Micrometer Sets (193 series only)

453102	0-3" set
453104	0-6" set
453105	6-12" set

Fitted Wooden Cases for Digit Micrometers and Combimikes (159 and 193 series only)

453109	5"
453110	6"
453111	7"
453112	8"
453113	9"
453114	10"
453115	11"
453116	12"

Fitted Plastic Cases for Outside Micrometers (101, 102, 103 series only)

450003	1"
450004	2"
450005	3"
450006	4"
450007	5"
450008	6"

Fitted Wooden Cases for Holtests

177-137	For 168-922
177-143	For 168-923
177-151	For 168-924

**BALL ATTACHMENT**

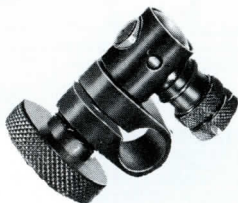
.200" dia. hardened steel ball. For .250" dia. Micrometer Anvil to measure concave surface or cylindrical wall thickness.

No. 101468

**TIE CLIP**

Gold-color plated handsome Tie Clip. Ideal for distributor promotion. A welcomed gift for all engineers.

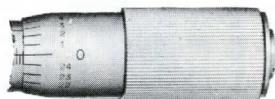
No. 101420

**UNIVERSAL SWIVEL CLAMP**

For Magnetic, Transfer and Measuring Stands. Accepts AGD Dial Indicator with 3/8" Stem.

No. 101467

No. 952243

**COLOR THIMBLE**

The friction ring comes in four colors. For MITUTOYO Micrometers Series 101, 117 and 103 with Friction Thimble only.

No. 201209 Red

No. 201210 Blue

No. 201211 Green

No. 201212 Gold

**DIAL PROTECTION COVER**

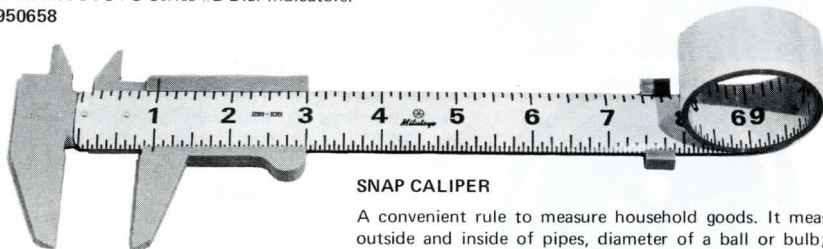
For Bore Gage, Dial Snap Gage and Dial Groove Gages. The cover is made of a durable plastic and fits on all MITUTOYO Series #2 Dial Indicators.

No. 950658

**HEAT-INSULATING HANDLE**

For larger Micrometer from 13" to 40". Attached to the frame to provide a better grip.

No. 950649

**SNAP CALIPER**

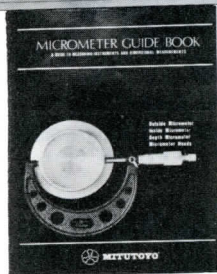
A convenient rule to measure household goods. It measures outside and inside of pipes, diameter of a ball or bulb; and many other items that are not easily measured by the standard tape rule.

No. 216-105 72" length

No. 216-104 36" length



FRACTION	DECIMAL	METRIC	FRACTION	DECIMAL	METRIC	FRACTION	DECIMAL	METRIC
1/16	.0625	1.60	1/32	.03125	0.80	1/16	.0625	1.60
1/8	.125	3.20	3/32	.09375	2.40	1/8	.125	3.20
3/16	.1875	4.80	1/4	.25	6.40	3/16	.1875	4.80
1/4	.25	6.40	5/16	.3125	8.00	1/4	.25	6.40
5/16	.3125	8.00	3/8	.375	9.60	5/16	.3125	8.00
3/8	.375	9.60	7/16	.4375	11.20	3/8	.375	9.60
7/16	.4375	11.20	1/2	.5	12.70	7/16	.4375	11.20
1/2	.5	12.70	9/16	.5625	14.30	1/2	.5	12.70
9/16	.5625	14.30	5/8	.625	16.00	9/16	.5625	14.30
5/8	.625	16.00	11/16	.6875	17.60	5/8	.625	16.00
11/16	.6875	17.60	3/4	.75	19.20	11/16	.6875	17.60
3/4	.75	19.20	13/16	.8125	20.80	3/4	.75	19.20
13/16	.8125	20.80	7/8	.875	22.40	13/16	.8125	20.80
7/8	.875	22.40	15/16	.9375	24.00	7/8	.875	22.40
15/16	.9375	24.00	1	1.0	25.40	15/16	.9375	24.00
1	1.0	25.40				1	1.0	25.40



D

To assist vocational and technical schools, MITUTOYO provides educational materials to qualified persons.

A. Decimal Equivalent Chart

Fraction to decimal and Metric equivalent. Each millimeter up to 25mm is listed along with its inch decimals.

B. Mitutoyo Films

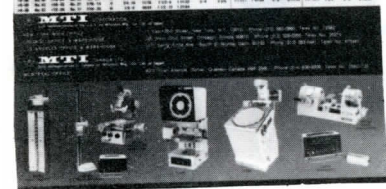
16mm color sound. Each film runs 25 to 30 minutes. Some of the titles are; MITUTOYO, Micrometers, Dial Indicators, Measuring XYZ etc.

C. Micrometer Wall Chart

Shows how to use regular and special micrometers. Describes how to read English micrometer .001" or to .0001", with Metric micrometer .01mm or to .001mm.

D. Micrometer Guide Book

The guide book covers basic and important aspects of micrometers, such as the principle of 40 THD spindle, accuracy specifications, how to zero-set, adjust and calibrate micrometers. Includes outside micrometers, inside micrometers depth micrometers and micrometer heads.





Common Fractions of an Inch to Millimeters

(Basis: 1 inch = 25.4 millimeters)

8ths	16ths	32nds	64ths	Decimal inch	Milli-meters
		1	1	.015625	0.396875
			3	.031250	0.793750
	1		5	.046875	1.190625
				.062500	1.587500
				.078125	1.984375
		3	7	.093750	2.381250
			9	.109375	2.778125
			5	.125000	3.175000
1				.140625	3.571875
				.156250	3.968750
	3		11	.171875	4.365625
			13	.187500	4.762500
		7	15	.203125	5.159375
				.218750	5.556250
				.234375	5.953125
		9	17	.250000	6.350000
			19	.265625	6.746875
				.281250	7.143750
	5			.296875	7.540625
				.312500	7.937500
		11	21	.328125	8.334375
			23	.343750	8.731250
3				.359375	9.128125
			25	.375000	9.525000
				.390625	9.921875
		13	27	.406250	10.318750
			29	.421875	10.715625
	7			.437500	11.112500
				.453125	11.509375
		15		.468750	11.906250
			31	.484375	12.303125
			33	.500000	12.700000
		17		.515625	13.096875
				.531250	13.493750
			35	.546875	13.890625

8ths	16ths	32nds	64ths	Decimal inch	Milli-meters
	9			.562500	14.287500
		19	37	.578125	14.684375
			39	.593750	15.081250
5				.609375	15.478125
				.625000	15.875000
		21	41	.640625	16.271875
	11		43	.656250	16.668750
				.671875	17.065625
			45	.687500	17.462500
				.703125	17.859375
		23	47	.718750	18.256250
				.734375	18.653125
			49	.750000	19.050000
		25		.765625	19.446875
				.781250	19.843750
			51	.796875	20.240625
	13		53	.812500	20.637500
		27		.828125	21.034375
			55	.843750	21.431250
				.859375	21.828125
7			57	.875000	22.225000
		29		.890625	22.621875
			59	.906250	23.018750
	15			.921875	23.415625
				.937500	23.812500
		31	61	.953125	24.209375
			63	.968750	24.606250
		32	64	.984375	25.003125
8	16			1.000000	25.400000

Note: Table is exact; all figures beyond the six places given are zeros.



Millimeters to Inches

(Basis: 1 inch=25.4 millimeters)

Millimeters Inches		Millimeters Inches		Millimeters Inches		Millimeters Inches	
1	.039370	26	1.023622	51	2.007874	76	2.992126
2	.078740	27	1.062992	52	2.047244	77	3.031496
3	.118110	28	1.102362	53	2.086614	78	3.070866
4	.157480	29	1.141732	54	2.125984	79	3.110236
5	.196850	30	1.181102	55	2.165354	80	3.149606
6	.236220	31	1.220472	56	2.204724	81	3.188976
7	.275591	32	1.259843	57	2.244094	82	3.228346
8	.314961	33	1.299213	58	2.283465	83	3.267717
9	.354331	34	1.338583	59	2.322835	84	3.307087
10	.393701	35	1.377953	60	2.362205	85	3.346457
11	.433071	36	1.417323	61	2.401575	86	3.385827
12	.472441	37	1.456693	62	2.440945	87	3.425197
13	.511811	38	1.496063	63	2.480315	88	3.464567
14	.551181	39	1.535433	64	2.519685	89	3.503937
15	.590551	40	1.574803	65	2.559055	90	3.543307
16	.629921	41	1.614173	66	2.598425	91	3.582677
17	.669291	42	1.653543	67	2.637795	92	3.622047
18	.708661	43	1.692913	68	2.677165	93	3.661417
19	.748031	44	1.732283	69	2.716535	94	3.700787
20	.787402	45	1.771654	70	2.755906	95	3.740157
21	.826772	46	1.811024	71	2.795276	96	3.779528
22	.866142	47	1.850394	72	2.834646	97	3.818898
23	.905512	48	1.889764	73	2.874016	98	3.858268
24	.944882	49	1.929134	74	2.913386	99	3.897638
25	.984252	50	1.968504	75	2.952756	100	3.937008

Note: The above table is approximate: $1/25.4 = 0.039370078740$



Inches to Millimeters

(Basis: 1 inch=25.4 millimeters)

Inches	mm	Inches	mm	Inches	mm	Inches	mm
1	25.4	26	660.4	51	1295.4	76	1930.4
2	50.8	27	685.8	52	1320.8	77	1955.8
3	76.2	28	711.2	53	1346.2	78	1981.2
4	101.6	29	736.6	54	1371.6	79	2006.6
5	127.0	30	762.0	55	1397.0	80	2032.0
6	152.4	31	787.4	56	1422.4	81	2057.4
7	177.8	32	812.8	57	1447.8	82	2082.8
8	203.2	33	838.2	58	1473.2	83	2108.2
9	228.6	34	863.6	59	1498.6	84	2133.6
10	254.0	35	889.0	60	1524.0	85	2159.0
11	279.4	36	914.4	61	1549.4	86	2184.4
12	304.8	37	939.8	62	1574.8	87	2209.8
13	330.2	38	965.2	63	1600.2	88	2235.2
14	355.6	39	990.6	64	1625.6	89	2260.6
15	381.0	40	1016.0	65	1651.0	90	2286.0
16	406.4	41	1041.4	66	1676.4	91	2311.4
17	431.8	42	1066.8	67	1701.8	92	2336.8
18	457.2	43	1092.2	68	1727.2	93	2362.2
19	482.6	44	1117.6	69	1752.6	94	2387.6
20	508.0	45	1143.0	70	1778.0	95	2413.0
21	533.4	46	1168.4	71	1803.4	96	2438.4
22	558.8	47	1193.8	72	1828.8	97	2463.8
23	584.2	48	1219.2	73	1854.2	98	2489.2
24	609.6	49	1244.6	74	1879.6	99	2514.6
25	635.0	50	1270.0	75	1905.0	100	2540.0

Note: The above table is exact.



PARTS LIST

Mitutoyo Tools and Instruments



MITUTOYO

MTI CORPORATION

New Jersey: 18 Egan Rd., Paramus, N.J. 07652
 Detroit: 12200 Wayne, Livonia, Mich. 48150
 Chicago: 2025 Tennen Rd., Elk Grove Village, Ill. 60007
 Los Angeles: 1430 Santa Anita Ave., South El Monte, Calif. 91733
 M.I.C., I.A.: 14847 B. Proctor Ave., City of Industry, Calif. 91744
 Montreal: 9910 Ryan Ave., Dorval, Quebec, Canada H9P 2M8

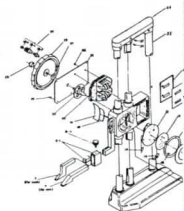
(201) 268-0525
 (212) 315-1080
 (212) 954-4370
 (714) 753-0441
 (213) 941-7538
 (514) 438-7004

MITUTOYO TOOL CO. LTD. 1-1-1, HIGASHI-KOJI, TOKYO 130, JAPAN

DEPTH HEIGHT GAGES

Series 192

Part No. 192-1-1970-JAN



NO.	PART NAME	CODE NO.	QTY.
1	FRAME	192-1-1	1
2	ANVIL	192-1-2	1
3	MEASURING FACE	192-1-3	1
4	SPRING	192-1-4	1
5	SCREW	192-1-5	1
6	WASHER	192-1-6	1
7	WASHER	192-1-7	1
8	WASHER	192-1-8	1
9	WASHER	192-1-9	1
10	WASHER	192-1-10	1
11	WASHER	192-1-11	1
12	WASHER	192-1-12	1
13	WASHER	192-1-13	1
14	WASHER	192-1-14	1
15	WASHER	192-1-15	1
16	WASHER	192-1-16	1
17	WASHER	192-1-17	1
18	WASHER	192-1-18	1
19	WASHER	192-1-19	1
20	WASHER	192-1-20	1
21	WASHER	192-1-21	1
22	WASHER	192-1-22	1
23	WASHER	192-1-23	1
24	WASHER	192-1-24	1
25	WASHER	192-1-25	1
26	WASHER	192-1-26	1
27	WASHER	192-1-27	1
28	WASHER	192-1-28	1
29	WASHER	192-1-29	1
30	WASHER	192-1-30	1
31	WASHER	192-1-31	1
32	WASHER	192-1-32	1
33	WASHER	192-1-33	1
34	WASHER	192-1-34	1
35	WASHER	192-1-35	1
36	WASHER	192-1-36	1
37	WASHER	192-1-37	1
38	WASHER	192-1-38	1
39	WASHER	192-1-39	1
40	WASHER	192-1-40	1
41	WASHER	192-1-41	1
42	WASHER	192-1-42	1
43	WASHER	192-1-43	1
44	WASHER	192-1-44	1
45	WASHER	192-1-45	1
46	WASHER	192-1-46	1
47	WASHER	192-1-47	1
48	WASHER	192-1-48	1
49	WASHER	192-1-49	1
50	WASHER	192-1-50	1
51	WASHER	192-1-51	1
52	WASHER	192-1-52	1
53	WASHER	192-1-53	1
54	WASHER	192-1-54	1
55	WASHER	192-1-55	1
56	WASHER	192-1-56	1
57	WASHER	192-1-57	1
58	WASHER	192-1-58	1
59	WASHER	192-1-59	1
60	WASHER	192-1-60	1
61	WASHER	192-1-61	1
62	WASHER	192-1-62	1
63	WASHER	192-1-63	1
64	WASHER	192-1-64	1
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67	WASHER	192-1-67	1
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93	WASHER	192-1-93	1
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95	WASHER	192-1-95	1
96	WASHER	192-1-96	1
97	WASHER	192-1-97	1
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99	WASHER	192-1-99	1
100	WASHER	192-1-100	1

192 DEPTH HEIGHT GAGES

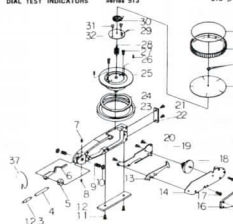
Series 192

Part No. 192-1-1970-JAN

DIAL TEST INDICATORS

Series 513

513



NO.	PART NAME	CODE NO.	QTY.
1	SPINDLE	513-1-1	1
2	SPINDLE	513-1-2	1
3	SPINDLE	513-1-3	1
4	SPINDLE	513-1-4	1
5	SPINDLE	513-1-5	1
6	SPINDLE	513-1-6	1
7	SPINDLE	513-1-7	1
8	SPINDLE	513-1-8	1
9	SPINDLE	513-1-9	1
10	SPINDLE	513-1-10	1
11	SPINDLE	513-1-11	1
12	SPINDLE	513-1-12	1
13	SPINDLE	513-1-13	1
14	SPINDLE	513-1-14	1
15	SPINDLE	513-1-15	1
16	SPINDLE	513-1-16	1
17	SPINDLE	513-1-17	1
18	SPINDLE	513-1-18	1
19	SPINDLE	513-1-19	1
20	SPINDLE	513-1-20	1
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22	SPINDLE	513-1-22	1
23	SPINDLE	513-1-23	1
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96	SPINDLE	513-1-96	1
97	SPINDLE	513-1-97	1
98	SPINDLE	513-1-98	1
99	SPINDLE	513-1-99	1
100	SPINDLE	513-1-100	1

513 DIAL TEST INDICATORS Series 513

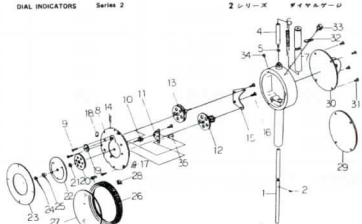
513

DIAL INDICATORS

Series 2

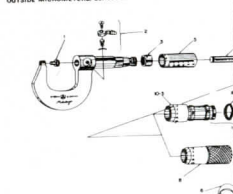
Part No. 2-1-1970-JAN

2シリーズダイヤル



NO.	PART NAME	CODE NO.	QTY.
1	SPINDLE	2-1-1	1
2	SPINDLE	2-1-2	1
3	SPINDLE	2-1-3	1
4	SPINDLE	2-1-4	1
5	SPINDLE	2-1-5	1
6	SPINDLE	2-1-6	1
7	SPINDLE	2-1-7	1
8	SPINDLE	2-1-8	1
9	SPINDLE	2-1-9	1
10	SPINDLE	2-1-10	1
11	SPINDLE	2-1-11	1
12	SPINDLE	2-1-12	1
13	SPINDLE	2-1-13	1
14	SPINDLE	2-1-14	1
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69	SPINDLE	2-1-69	1

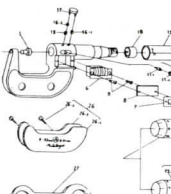
OUTSIDE MICROMETERS, Series 101



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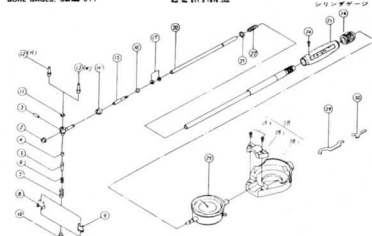
101 OUTSIDE MICROMETERS, Series 101

DIGIT OUTSIDE MICROMETERS
Series 193

[illegible]

193 DIGIT OUTSIDE MICROMETERS, Ref. No. 193

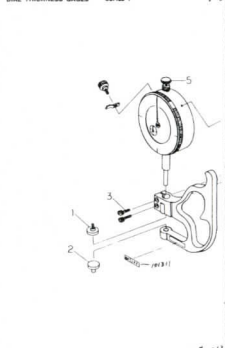
BORE GAGES, Series 512

[illegible]

22	NO. 141-142-143	141-142	141-143
23	NO. 141-142-143	141-142	141-143

511 BORE GAGES, Series 511 Ref. No. 511-2 1976-1980

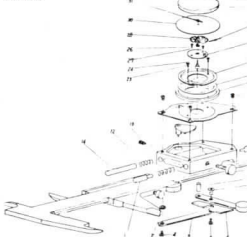
DIAL THICKNESS GAGES Series 7



PART NAME	CODE NO	QTY	PRICE
1 POINT	101314	101308	101318
2 NUTS		1001310	
3 SCREW FRAME		1001318	
4 NUT FRAME		100220	
5 SCREW SPRINGS STOP	101315		101303
6 LEVER		900025	
7 SCREW LEVER		101068	

7 DIAL THICKNESS GAGES Series 7

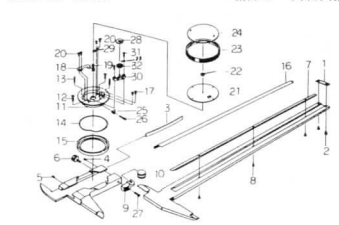
DIAL SNAP CALIPERS
Series 538



NO.	FILE#	NAME	DATE	TIME	NO.
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47	1	1	1	1	1
48	1	1	1	1	1
49	1	1	1	1	1
50	1	1	1	1	1

538 DIAL SNAP CALIPERS,
Series 538

DIAL CALIPERS Series 1

[illegible]

505 DIAL CALIPERS Series 505



MEMO



MEMO



MEMO



MEMO

MEMO

WHAT DOES MITUTOYO STAND FOR?

We are frequently asked what "Mitutoyo" means and why we chose it as the company name instead of using the founder's.

The "Mitu" of Mitutoyo stands for Three and the "Toyo" of Mitutoyo signifies Abundance. The following is our interpretation.

First of all, we feel the necessary qualities that make up a perfect man are Wisdom, Benevolence and Valor. Wisdom is the power of correct observation; Benevolence a manifestation of mercy and sympathy toward other — and Valor is the power to carry out resolutely what is right.

Secondly, we feel the key to success in business lies in the knowledge of heaven, earth and man. Business will succeed only when factors such as "heaven-sent" chances, natural advantages and the unity of men are present. If any one of these factors is lacking, the business will not be successful.

Thirdly, in the field of religion, the three factors are represented in Buddhism by Butsu (Buddha), Po (doctrine) and So (Priest) — and in Christianity by God, Bible and Priest or Minister. World peace is maintained by the presence of these three factors, which all religions advocate.

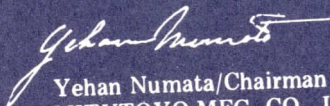
In the hope of attaining our ideals of becoming a perfect man, being successful in business and contributing toward world peace, the company was given the name "MITUTOYO," for Mitutoyo is not an organization whose goal is simply the pursuit of profit.

I, Yehan Numata, founder and Chairman of the company was born in Japan and educated in the University of California, at Berkeley. From my experiences in the United States, which I remember with great affection, I concluded that every individual, no matter how different his work and working place may be — can become a perfect man and be successful. In this way he will contribute to world peace.

This then is the reason the company was named MITUTOYO.

I wish you good health, and pray for the eternal peace of the world.

Very truly yours,



Yehan Numata/Chairman of the Board
MITUTOYO MFG. CO., LTD.



Mitutoyo



MTI CORPORATION

Sole representatives in the U.S.A. for Mitutoyo Mfg. Co., Ltd. of Japan

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& WAREHOUSE**

**DETROIT OFFICE
& WAREHOUSE**

**CHICAGO OFFICE
& WAREHOUSE**

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